HEWLETT hp PACKARD

OPERATING AND SERVICE MANUAL

MODEL 8007B
PULSE GENERATOR

This manual corresponds to instruments
with the serial number prefix:

1238G

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MANUAL CHANGES

Model Number	8007B
Date Printed :	Oct. 1972
Part Number	08007-90002

This supplement contains important information for correcting manual errors and for adapting the manual to instruments containing improvements made after the printing of the manual.

To use this supplement:

Make all ERRATA corrections

Make all appropriate serial number related changes indicated in the tables below.

Serial Prefix	Make Changes	Serial Prefix	Make Change
1612G 00286 to 00295	1		
1612G 00296 to 00305	1,2		
1612G 00306 to 00345	1-3		
1729G 00346 to 00385	1-4		
1729G00386 to 00415	1-5		
1729G 00416 onwards	1-6		
1729G 00426 onwards	1-7		

ERRATA

1. Parts List for assembly A2 should include:

R726	0757-0440	R-F 7.5K 1% 1/8W
R749	0698-6746	R-F 43 5% 1/8W

2. Diagram 3, sheet 2: R706 in the Q703 circuit should read R726.

3. Paragraph 1-4, item 2 should refer to the double pulse description in paragraph 1-5: not paragraph 1-15.

4. Paragraph 4-40 should refer to diagram 3, sheet 2 in section 6.

5. Diagram 2 sheet 2: the EXT WIDTH signal at the upper right-hand corner of the page goes "to sheet 3".

6. Diagram 2 sheet 3: the EXT WIDTH signal at the upper left-hand corner of the page comes "from sheet 2".

7 Diagram 6: a line filter should be added to the primary circuit.
The following diagram represents the primary circuit more accurately than as shown in diagram 6.

April 1978

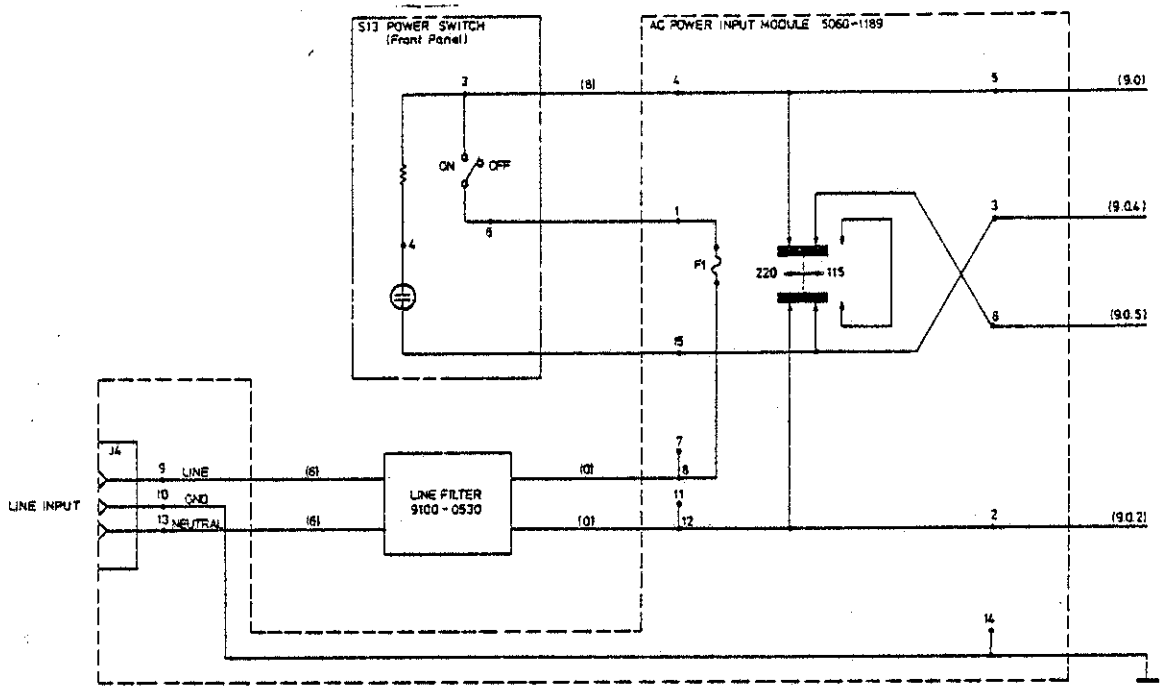


FIGURE FOR ERRATA 7

CHANGE 1

Parts list for frame:

Delete		
S13	3101–1244	SWITCH PUSHBUTTON
Add		
S13	3101–1720	SWITCH PUSHBUTTON
	0370–0914	BEZEL PUSHBUTTON
	5040–1124	KNOB PUSHBUTTON
DS1	1460–0049	PILOT LIGHT(DS1 is pilot lamp adjacent to LINE switch)
	0510–0097	RETAINER PUSH-ON
	08007–00205	PANEL SUB
	08007–00206	PANEL FRONT

Page 2–0. Delete rack mounting kit from figure 2–1.

Page 2–1. Delete rack mounting kit from table in paragraph 2–4.

Page 2–2. Add paragraphs 2–20, 2–21:

2–20 Rack Mounting Kit

2–21 A rack mounting kit is available for the 8007B as option 908. The kit will be shipped with the instrument if ordered with the instrument.

Facing diagram 1. Delete MP28 from the overall parts list.

CHANGE 2

A1R207 is changed to factory select (*)

A1R207	0757-0406	R-F 182 ± 1% 1/4 W (Preferred)
A1R207	0698-4413	R-F 154 ± 1% 1/4 W
A1R207	0698-4416	R-F 169 ± 1% 1/4 W
A1R207	0757-0407	R-F 200 ± 1% 1/4 W

Change A1C15 0160-2940 C-F 470P ± 5% 300V MICA

Delete A2R733 (replaced by wire link)

Add	A2HQ604	1205-0037	HEATSINK
	A2HQ605	1205-0037	HEATSINK

CHANGE 3

Replace A9 L802/3/4 by A9 L802 5081-1973 IN AY

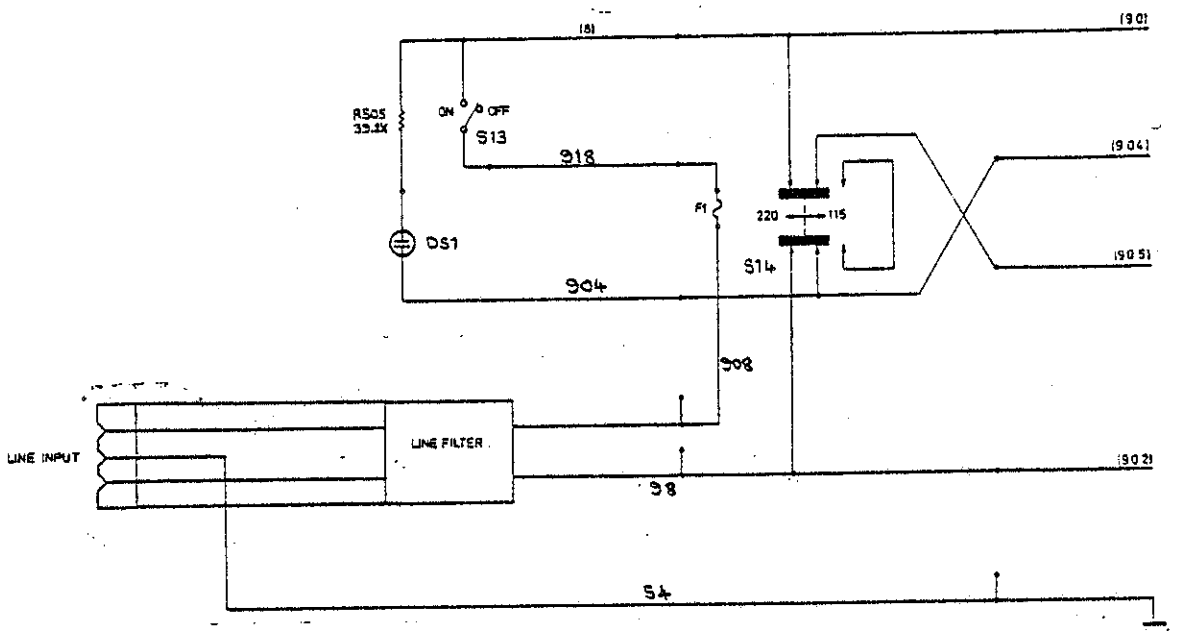
CHANGE 4

In overall parts list, add the following items.

FL1	9135-0035	LINE FILTER
S14	3101-1740	LINE SEL. SWITCH
MP29	0800 7-6020 7	PANEL, REAR ASSY
XF1A	2110-0465	CAP FUSE H
XF1B	2110-0467	NUT HEX
XF1C	2110-0470	FUSE HOLDER BODY
XF1D	1400-0090	WASHER NED

Change diagram 6 as per attached page 4.

MODEL 8007B



Change 5

Diagram 1. Change the overall replaceable parts list as follows:
S13 3101-2216 SW PBTN

Change 6

Diagram 3. Change parts list as follows:
A2C608 0160-3878 C-F 0.001 UF 100V

Change 7

Diagram 3 Sheet 1. Change parts list and schematic A2C22 0160-4209
C-F 0.01 UF 50 V

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LIST OF TABLES

LIST OF ILLUSTRATIONS

Table 1–1. Specifications

PULSE CHARACTERISTICS
(50Ω source and load impedance)

Transition Times: 2ns – 250μs in three ranges. Ranges are common for rise and fall times but independent verniers provide separate control of rise and fall time within each range up to maximum ratios of 1:50 or 50:1.

Linearity: For transition times > 20ns, maximum amplitude deviation from a straight line between the 10% and 90% points is less than 3% of pulse amplitude.

Overshoot and Ringing: < ± 5% of pulse amplitude.

Preshoot: < ± 5% of pulse amplitude.

Pulse Width: < 5ns to 50ms in five ranges. Vernier provides continuous adjustment within ranges.

Width Jitter: < 0.1% on any width setting.

Maximum Duty Cycle: Normal > 50%; complementary 100%.

Amplitude: up to 5V across 50 ohms, 10V across an open circuit.

Attenuator: Four step attenuator reduces output voltage to a minimum range of 0.5V to 0.2V. Vernier provides continuous adjustment within each range. A fifth position of the attenuator reduces the pulse amplitude to zero volts.

Pulse Output: Positive or negative polarity selectable. Normal, complementary or symmetrical to baseline also selectable.

Source Impedance: 50Ω ± 4Ω shunted by 10pF (nominal).

DC Offset: ± 4V across 50Ω load. Independent of amplitude settings, can be switched off.

Pulse Delay: < 30ns to 50ms with respect to trigger output. Five ranges, vernier provides continuous adjustment within ranges.

Delay Jitter: < 0.1% on any delay setting.

REPETITION RATE AND TRIGGER

Repetition Rate: 10 Hz to 100 MHz in five ranges. Ver-

Period Jitter: < 0.1% on any repetition rate setting

Double Pulse: Available only up to pulse rate settir 50MHz, representing an output pulse rate of 100MH

Trigger Output: Amplitude: > +1V across 50Ω.
Width: 4ns ± 2ns.

EXTERNALLY CONTROLLED OPERATION

External Input
Input Impedance: 50Ω dc-coupled.

Maximum Input: ± 5V.

Trigger Level: Continuously adjustable from +1V to

Trigger Polarity: Positive or negative slope selectable

Sensitivity: Sine waves, 1V peak-to-peak,
Pulses, + 0.5V peak.

External Triggering
Repetition Rate: 0 to 100 MHz.

Delay: Approximately 10ns between trigger input trigger output.

Manual: Front-panel push button for single p

External Pulse Width: Output pulse width determine width of external input pulse.

Width Trigger: External input pulse applied to the w generator. Pulse width determined by front panel w setting.

Synchronous Gating: Gating signal turns generator " First pulse coincident with leading edge of the gate pulse is normal width even if gate en.'s during pulse.

GENERAL

Operating temperature range: 0°C to +55°C.

Power Requirements: 115 or 230V + 10%, -15% to 440 Hz, 100VA (maximum).

Weight: net 8 kg (17.6lb), shipping 9 kg (19.8lb)

Dimensions: 425 x 140 x 344 mm (16 3/4 x 5

SECTION 1

GENERAL INFORMATION

1–1 INTRODUCTION

1–2 The Hewlett-Packard Model 8007B Pulse Generator is a multipurpose pulse source with front panel controls for transition times, pulse amplitude, repetition rate, pulse delay and pulse width. The output is usually developed across a 50 ohm external impedance and may be either positive or negative. In addition, a symmetrical pulse (in which the positive and negative limits of the pulse amplitude are an equal amount above and below ground potential) or the complement of the pulse may be selected by means of a front panel control. If desired, a dc bias may be introduced to the waveform baseline.

1–3 The pulse generator may be triggered internally with its own repetition rate generator or externally either with an externally generated trigger pulse or manually with a front panel pushbutton.

1–4 Externally applied signals can be used in four ways to control the output pulse pattern.

1. As a gate signal. The output pulse train is generated for as long as the applied signal is present. The repetition rate pulse width and pulse delay remain under the control of the front panel.

2. As an external trigger. One pulse out for each trigger in. All other parameters remain under control of front panel. (Also see double pulse description, paragraph 1–15).

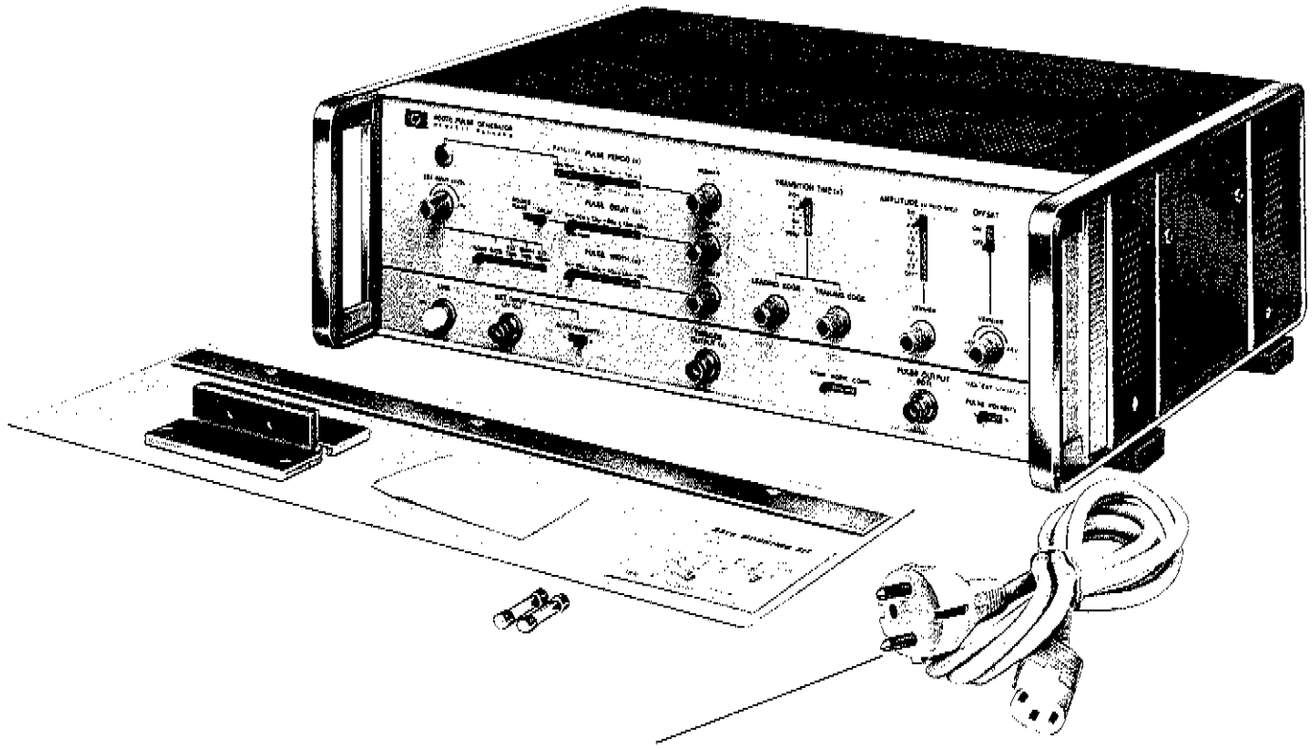
3. As a width trigger. Like the external trigger except that the signal is introduced at the input to the width control circuits. The rep. rate generator can supply a trigger output independent of the pulse output. The pulse delay is fixed at typically 20ns.

4. As an external width trigger. Like the width trigger except that the external width trigger is introduced at the output of the width control circuits. The output pulse width is determined by the width of the incoming trigger.

1–5 By switching to DOUBLE PULSE on the front panel, two pulses can be produced in response to each trigger. The first pulse occurs a fixed interval after the trigger, the second pulse is delayed by an interval selected by front panel controls. Double pulses can be produced in the normal, gate and external trigger modes only.

1–6 AVAILABLE ACCESSORIES

1–7 Electronic test equipment, cables, connectors, adapters and other accessories are available from Hewlett-Packard. For information about specific items, consult the Hewlett-Packard catalog or contact the nearest Sales/Service Office. Addresses are listed at the back of this manual.



The power cable supplied will be ONE of the following:

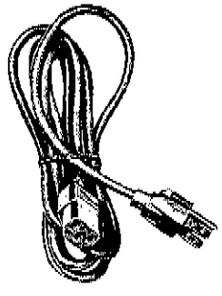
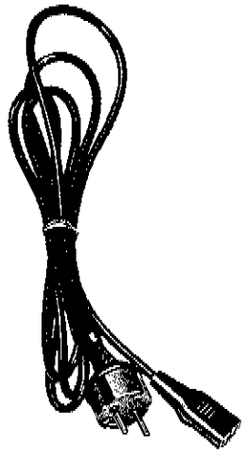
NEMA 8120–1378	SCHUKO 8120–1689	BRITISH STANDARD 8120–1351
		
LINE = BLACK NEUTRAL = WHITE GROUND = YELLOW/GREEN	LINE = BROWN NEUTRAL = BLUE GROUND = YELLOW/GREEN	LINE = BROWN NEUTRAL = BLUE GROUND = YELLOW/GREEN

Figure 2–1. Accessories Delivered

SECTION 2

INSTALLATION

2–1 GENERAL

2–2 Initial Inspection

2–3 Inspect instrument and accessories for physical damage and if damage is evident refer to paragraph 2–15 for recommended claim procedure and repacking information.

2–4 The 8007B is delivered with the following items:

ITEM	HP STOCK NUMBER
Power Cable (with one of the following plugs)	
NEMA*	8120–1378
or	
SCHUKO**	8120–1689
or	
BS***	8120–1351
Fuses	
0.5 amp (for 230V operation)	2110–0202
1 amp (for 115V operation)	2110–0007
Rack Mounting Kit	5060–8740
Manual	08007–90002

* Used in USA
** Used in West Germany
*** Used in UK and (for 230V) in USA

2–5 Temperature Requirements

2–6 The Model 8007B operates within specifications when the ambient temperature is between 0°C (32°F) and 55°C (131°F). The pulse generator may be stored between −40°C (−40°F) and 75°C (167°F).

2–7 INSTALLATION

2–8 Power Cable

2–9 The 3-wire power cable supplied with the 8007B when connected to the appropriate power outlet, grounds the instrument cabinet and panels. To preserve this safety feature when operating the instrument from an outlet without a ground connection use an appropriate adapter and connect the ground lead to an external ground.

2–10 Power Source Requirements

2–11 The Model 8007B may be operated from an ac line supply of either 115V or 230V (+10%, −15%) at 48 Hz to 440 Hz. The power dissipation is typically 100VA.

CAUTION

Before applying power to the instrument, check that the power module on the rear panel is set in accordance with local supply conditions.

2–12 To check the power module proceed as follows:

a. Slide the safety window to the left.

b. Remove the fuse and check its value:
for 230V operation 0.5A,
for 115V operation 1.0A.

c. Check that the line selector switch position corresponds to the local supply voltage. If it does not corresponds use a screwdriver to change the switch position.

d. Insert the correct fuse into the fuse holder and slide the safety window to the right.

e. Connect the power cable to the power module.

2–13 PRELIMINARY CHECKS

2–14 At this point it is convenient to check that

the instrument operates within specifications. Preliminary checks suitable for incoming quality control inspection are described in Section V. If the instrument does not perform satisfactorily, refer to paragraph 2–15.

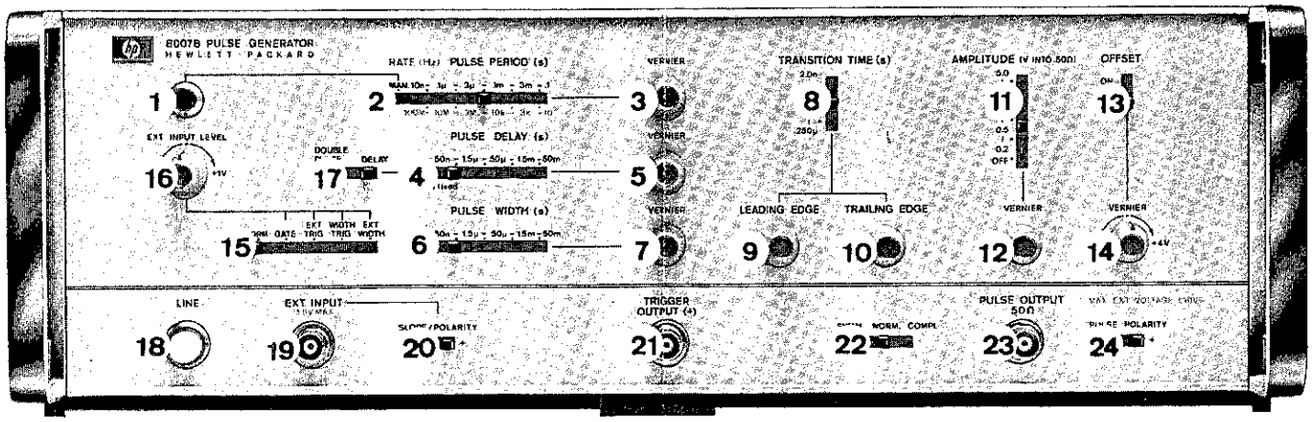
2–15 CLAIMS AND REPACKAGING

2–16 Claims for Damage

2–17 If physical damage is evident or if the instrument does not meet specifications when received, notify the carrier and the nearest Hewlett-Packard Sales/Service Office. The Sales/Service Office will arrange for repair or replacement of the unit without waiting for settlement of the claim against the carrier.

2–18 Repackaging for Shipment or Storage

2–19 If the instrument is to be shipped to an Hewlett-Packard Sales/Service Office, attach a tag showing owner, address, model and serial number and the repair required. The original shipping carton and packing material may be re-usable but the Hewlett-Packard Sales/Service Office will also provide information and recommendations on materials to be used if the original packing is not available or re-usable.



1. Push button to generate a single pulse (or two in the double pulse mode) when the PULSE PERIOD switch is in the MAN position.

2. PULSE PERIOD switch: for selecting the range of pulse period.

3. Pulse period VERNIER: for continuous adjustment of the repetition rate within the range selected on the PULSE PERIOD switch. Clockwise rotation increases the pulse period. In the WIDTH TRIG and EXT WIDTH modes the pulse period controls define only the frequency of the trigger output pulses.

4. PULSE DELAY switch: for selecting the range of pulse delay with respect to trigger output in NORM, GATE and EXT TRIG modes. Has no effect in WIDTH TRIG and EXT WIDTH modes.

5. Pulse delay VERNIER: for continuous adjustment of pulse delay within the range selected on the pulse delay switch. Clockwise rotation increases the delay.

6. PULSE WIDTH switch: for selecting the range of pulse width. Has no effect in the EXT WIDTH mode.

7. Pulse width VERNIER: for continuous adjustment of pulse width within the range set on the pulse width switch.

8. TRANSITION TIME switch: for selecting the range of leading and trailing edge transition times.

9. LEADING EDGE vernier: for continuous adjustment of the leading edge transition time within the range selected on the transition time switch.

10. TRAILING EDGE vernier: for continuous adjustment of the trailing edge transition time within the range selected on the transition time switch.

11. AMPLITUDE switch: for selecting the amplitude range of output pulses.

12. Amplitude VERNIER: for continuous adjustment of output pulse amplitude within the range selected on the amplitude switch.

13. OFFSET switch: for enabling/disabling the offset VERNIER.

14. Offset VERNIER: for adjustment of the pulse output baseline between +4 volts and –4 volts when the offset switch is on.

15. Mode switch: selects either the internal mode (NORM) or one of the external modes in which an input signal at EXT INPUT is required.

16. EXT INPUT LEVEL control: determines the level, within a range of +1 volt to –1 volt, at which the signal applied to EXT INPUT will initiate a pulse or gate a pulse train.

17. DOUBLE PULSE – DELAY switch: in the double pulse position the 8007B delivers two pulses for every trigger output; the first pulse is delayed by a fixed 20 nanoseconds with reference to the trigger output, the second is delayed by an interval determined by the PULSE DELAY controls. The double pulse facility is disabled in the WIDTH TRIG and EXT WIDTH modes.

18. LINE switch: press for on, press for off.

19. EXT INPUT connector: for input of gate signals in the GATE mode and trigger pulses in the EXT TRIG, WIDTH TRIG and EXT WIDTH modes.

20. SLOPE/POLARITY switch: selects the slope (rising or falling) of the input signal which will cause triggering/gating.

21. TRIGGER OUTPUT connector: supplies trigger pulses at a rate determined by the setting of the pulse period controls. Exceptionally in EXT TRIG mode the trigger output rate is the same as the trigger input rate.

22. SYMM NORM COMPL switch: for selecting symmetrical normal or complementary pulse formats.

23. PULSE OUTPUT connector.

24. PULSE POLARITY switch: for selecting the polarity of the output pulse.

Figure 3–1. 8007B Front Panel: Control Identification

3–1 MODES OF OPERATION

3–2 There are five modes of operation in which the 8007B is capable of operating, four of which require an external signal.

3–3 Normal Mode

3–4 In this mode, no external signal is required. Pulse period, pulse delay, pulse width, transition times, amplitude, offset, polarity and format (SYMM, NORM, COMPL), as well as single or double pulse, are all selectable or adjustable with front panel controls. See figures 3–2 to 3–5.

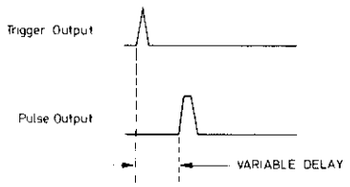


Figure 3–2. Pulse Delay

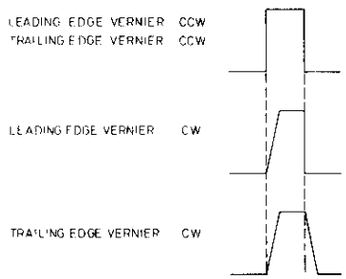


Figure 3–3. Transition Time Verniers

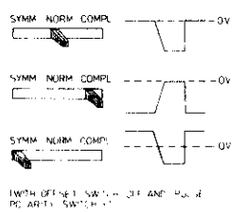


Figure 3–4. SYMM. NORM. COMPL. Switch

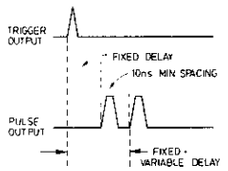


Figure 3–5. Double Pulse

3–5 Gate Mode

3–6 The repetition rate is defined by the pulse period controls but no output occurs until the voltage of the externally applied gate crosses the threshold level set by the EXT INPUT LEVEL and in the direction indicated by the setting of the SLOPE/POLARITY switch. See figure 3–6. The last pulse of a train of gated pulses is always of correct width and slope even if the gate ends during the pulse.

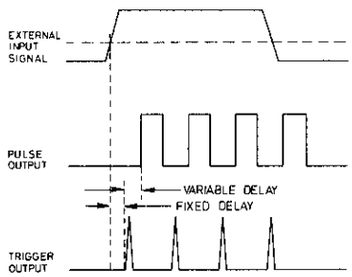


Figure 3–6. Gate Mode Operation

3–7 External Trigger Mode

3–8 The pulse repetition rate and trigger output rate are determined by the frequency of an applied signal. All other output pulse parameters are controllable as in the normal mode. See figure 3–7.

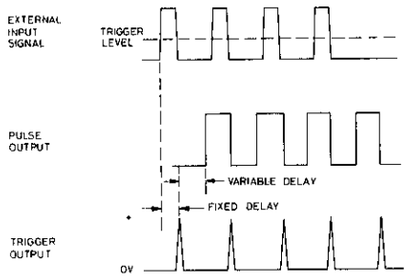


Figure 3–7. External Trigger Operation

3–9 Width Trigger Mode

3–10 The pulse repetition rate is determined by the frequency of the externally applied signal. The frequency of the trigger output is independent of the pulse output and can be adjusted with the pulse period controls. The pulse delay is fixed at ⩽ 40 nanoseconds with respect to trigger input. All other pulse parameters are controllable as in the normal mode. See figure 3–8.

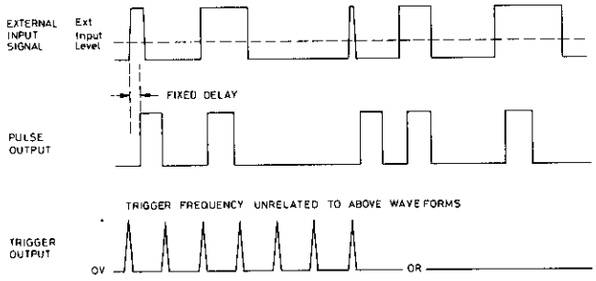


Figure 3–8. Width Trigger Operation

3–11 External Width Mode

3–12 The pulse repetition rate and pulse width are determined by the externally applied signal. The frequency of the trigger output is independent of the pulse output and can be adjusted with the pulse period controls. The pulse delay is fixed at ⩽ 40 nanoseconds with respect to trigger input. All other parameters are controllable as in the normal mode. See figure 3–9.

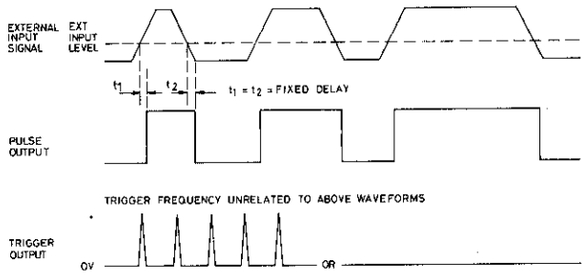


Figure 3–9. External Width Operation.

3–13 OPERATIONAL CONSIDERATIONS

3–14 Termination

3–15 To achieve the specified amplitudes and transition times and to minimize reflection, it is most important that the pulse output be terminated by 50 ohms to ground. Even at low repetition rates the pulses contain harmonics in the UHF range.

3–16 Pulse Period, Width and Delay Controls

3–17 The positions of these controls on the front panel helps avoid incompatible settings. Generally, the PULSE PERIOD switch should be the furthest to the right; if all three are in a straight vertical line, the vernier positions are critical. See figure 3–10.

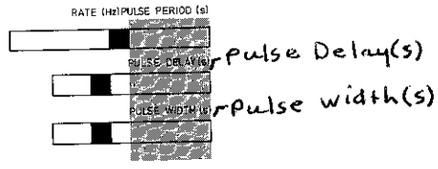


Figure 3–10. Positioning of Rate Delay and Width Controls

3–18 Transition Times Controls

3–19 The "on time" of a pulse should be greater than its rise time, the "off time" greater than the fall time. See figure 3–11.

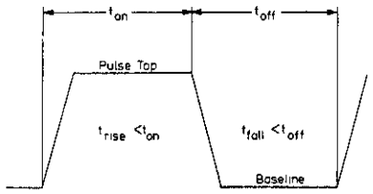


Figure 3–11. Transition Time Limits

3–20 EXTERNAL INPUT CHARACTERISTICS

3–21 The EXT INPUT LEVEL control and the SLOPE/POLARITY switch define the point on the input signal which will cause triggering (or gating). Figure 3–12 illustrates the effects of these controls in the external width mode.

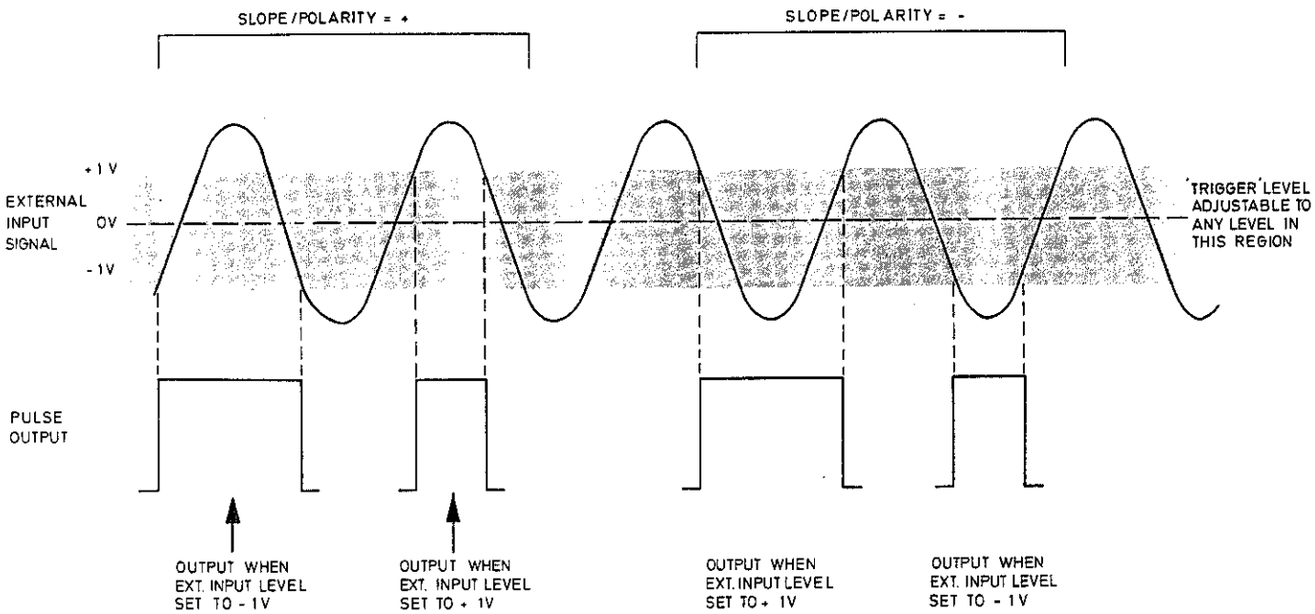


Figure 3–12. External Input Adjustments

FIG 4-0
SHT 1 OF 2

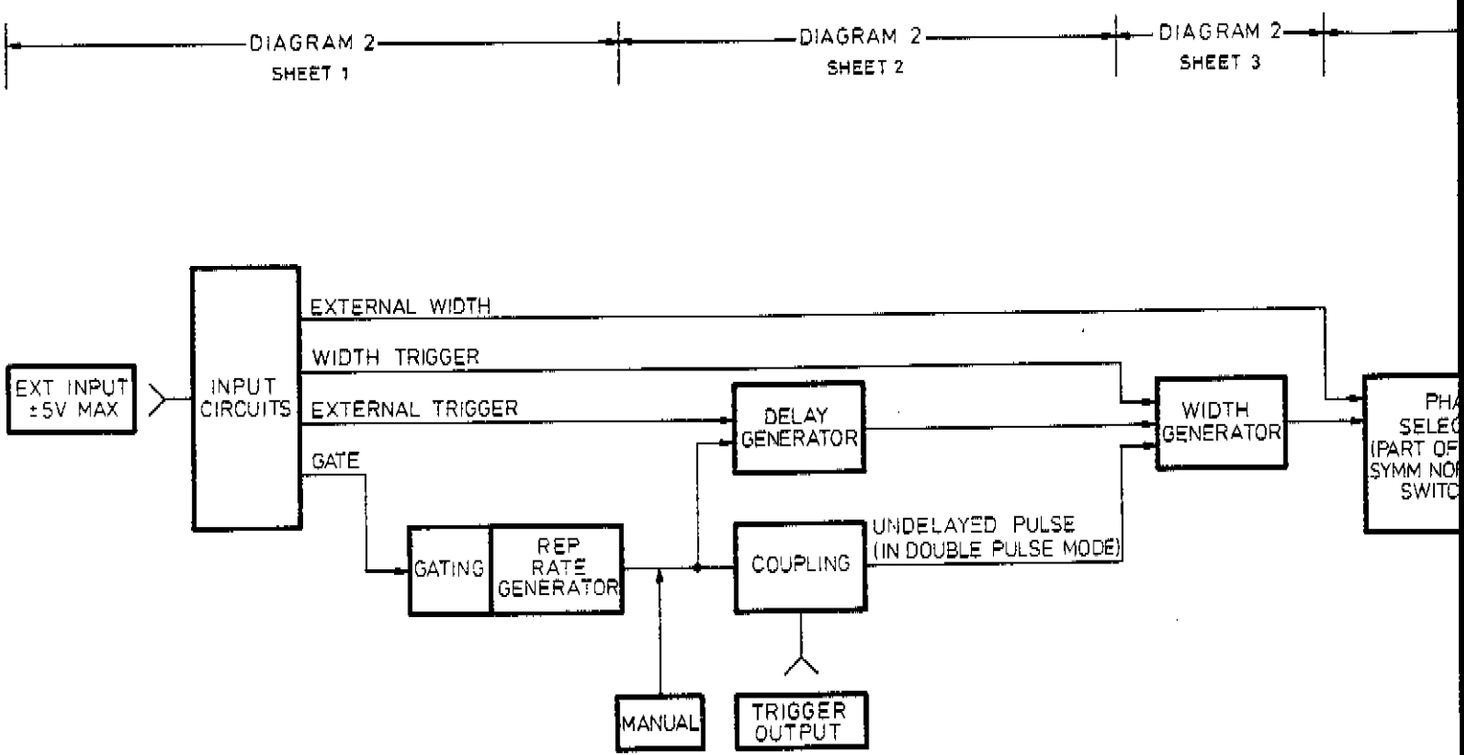
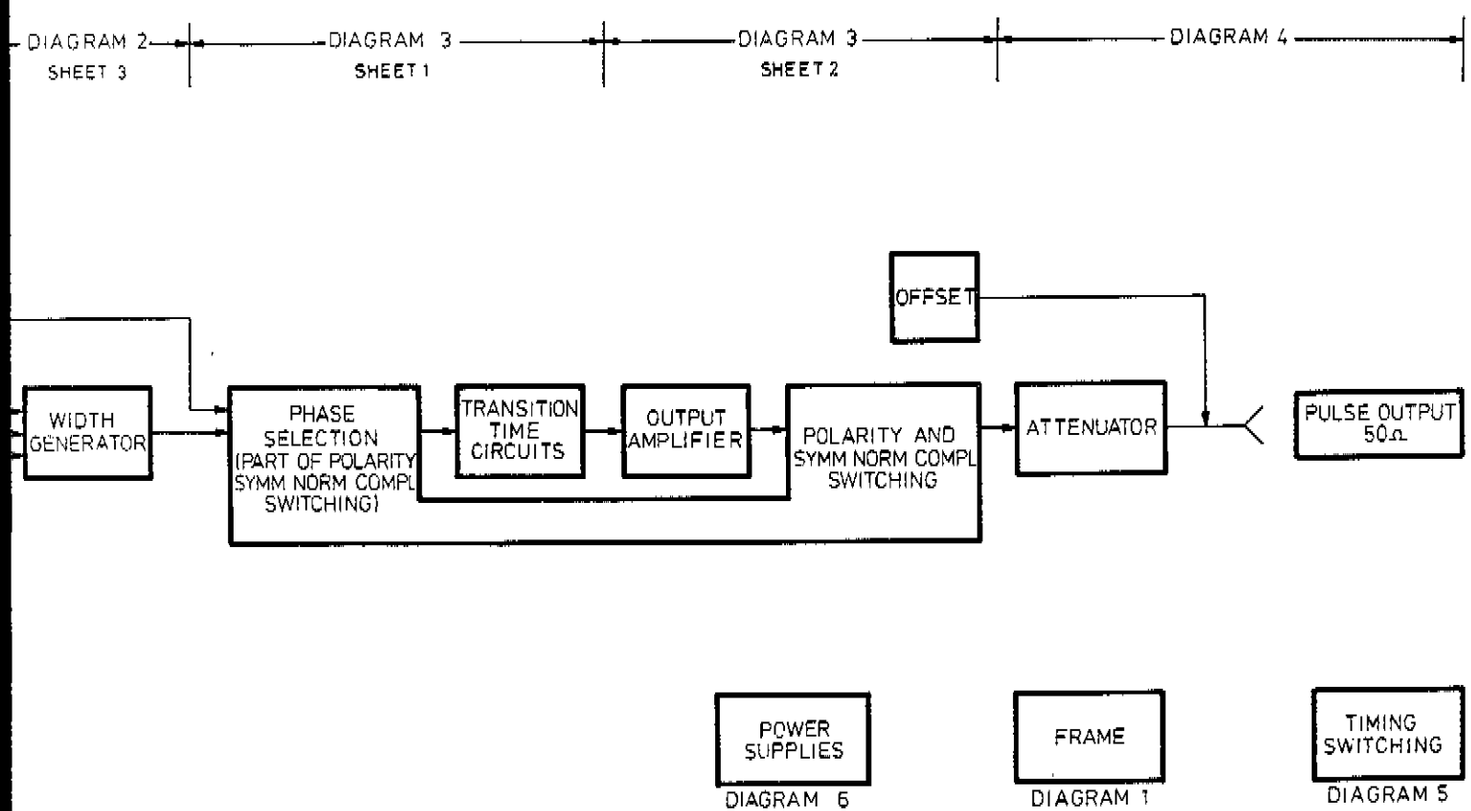


Figure 4–0. Block Diagram

Fig 4-0
Sht 2 of 2



4–1 GENERAL DESCRIPTION

4–2 The basic concept of the 8007B pulse generator is shown in figure 4–0, opposite. The pulse repetition rate is generated either internally by the repetition rate generator or externally by an external trigger. Gating can be effected by using the external trigger to start and stop the repetition rate generator. The delay generator delays, with respect to the trigger output, the output from the rep. rate generator and applies it to the width generator. For each output pulse from the delay generator, the width generator issues a pulse with a width defined by the front panel controls. The output of the width generator is split into two phases, one of which is selected by the pulse polarity and SYMM–NORM–COMPL switching circuits for further processing. The selected phase is integrated by charging and discharging a capacitor by a positive and a negative current source. Current sources are independently variable. The output of the transition time circuits is limited, amplified and, under control of the pulse polarity and SYMM–NORM–COMPL switches, given a dc reference. The signal is then attenuated by a network of resistors selectable under the control of the amplitude range switch and by the amplitude vernier. The dc offset potential is applied to the output or the attenuator and the combined signal is made available at the pulse output connector. In the following description, reference should also be made to the appropriate diagrams in Section 6, as indicated by the block diagram.

4–3 REPETITION RATE GENERATOR

4–4 See figure 4–1. When the Schmitt trigger changes to the "Q2 conducting" state, Q4 conducts thereby discharging C3. C3 discharges to a potential low enough to cut off Q2, at which point the Schmitt trigger switches to the "Q2 cut off" state. Thus, Q4 becomes cut off and C3 starts charging. C3 charges to a potential high enough to make Q2 conduct, at which point the Schmitt trigger changes to the "Q2 conducting" state again.

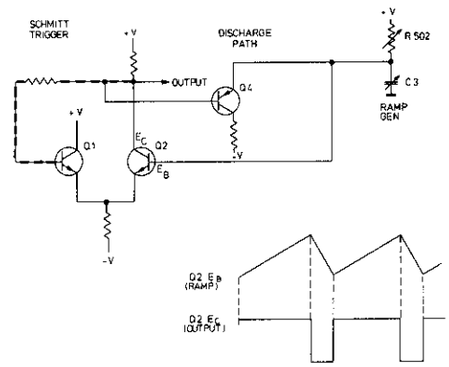


Figure 4–1. Simplified Rep. Rate Generator

4–5 The rep. rate generator runs free in the NORM, WIDTH TRIG and EXT WIDTH modes (Q118 reverse biased). In the GATE and EXT TRIG modes or with the pulse period switch in the MAN position, Q118 is forward biased; this prevents the Schmitt trigger from changing states regardless of the ramp potential.

4–6 Gating

4–7 With Q118 forward biased, the rep. rate generator is disabled. See figure 4–2. Q118 is forward biased when both Q116 and Q117 are cut off. Q117 is cut off by the mode switch being in the GATE or EXT TRIG positions or the PULSE PERIOD switch being in the MAN position. Q116 is cut off when no gate signal is present. A gate signal, applied at EXT INPUT, is processed by the input circuits (see following paragraph) and applied to differential amplifier Q115/Q116 through input switch Q104. The gate signal causes Q116 to conduct, Q118 to be reverse biased and the rep. rate generator to function.

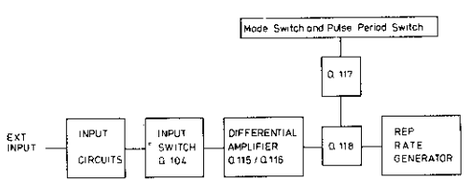


Figure 4–2. Gating Elements

4–8 EXTERNAL SIGNALS

4–9 The external signals are applied to the EXT INPUT connector on the front panel. How a signal is used and where in the instrument it is applied are determined by the mode switch (Section 6, diagram 2, sheet 1).

4–10 Ext. Input Level and Slope/Polarity

4–11 An external signal, applied to the EXT INPUT connector, is limited to one volt by the diode bridge limiter CR101 through CR104. The one volt maximum signal from the limiter is applied to the differential amplifier Q101/Q102. The EXT INPUT LEVEL control determines the reference level of the differential amplifier. The SLOPE/POLARITY switch selects either the inverting or the non-inverting output by blocking the other output. With the SLOPE/POLARITY switch in the + position, the non-inverting signal is blocked.

4–12 Q103 establishes the required dc level for input to the Input Switches, Q104 through Q107.

4–13 Mode Switch

4–14 The mode switch allows the external signal from Q103 to pass through one or none of the input switches Q104 – Q107.

4–15 PULSE DELAY

4–16 The purpose of the pulse delay generator is to provide pulses which are delayed with respect to the TRIGGER OUTPUT pulse by a controllable interval. The delay is accomplished by triggering a monostable circuit whose output pulse is variable in width and using the trailing edge of the output pulse to produce the delayed pulse.

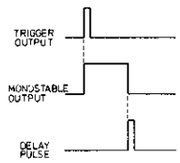


Figure 4–3. Pulse Delay Principle

4–17 The monostable circuit consists of Schmitt trigger Q301, Q302, Q303, ramp generator Q307, C301, C302 and the ramp discharge path through Q304. With the monostable in its stable state, Q301 is cut off, Q302 and Q304 conduct. A positive pulse on the base of Q301 switches the Schmitt trigger's state, Q302 becomes cut off, the ramp generator starts raising the potential on the base of Q302. When base Q302 reaches the Schmitt trigger switch-over level, Q302 starts conducting again. This puts a negative on the base of Q304 which causes the ramp generator to discharge through Q304. The level to which the ramp discharges is not negative enough to cut off Q302 so the circuit remains stable until Q301 receives another positive pulse.

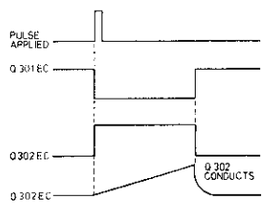


Figure 4–4. Delay Monostable Timing.

4–18 Schmitt trigger A1MC2 produces the delayed pulse in response to the negative going edge of the delay circuit monostable.

4–19 In the WIDTH TRIG and EXT WIDTH modes, the delay generator is not required. The S1.2 part of the mode switch blocks the input and output of the delay circuits through Q204 and Q206 respectively.

4–20 TRIGGER OUTPUT

4–21 Schmitt trigger A1MC1 produces short (~3ns) pulses in response to negative transients from either the rep. rate generator, the external trigger of the manual trigger. The Schmitt trigger output is amplified by differential amplifier Q201/Q202. The complementary outputs are applied to 1) the delay circuits and 2) the OUTPUT TRIGGER and DOUBLE PULSE circuits.

4–22 DOUBLE PULSE

4–23 In the double pulse mode, an undelayed pulse and a delayed pulse are applied to input of the width circuits in response to each trigger. The delayed pulse comes from the delay circuits, the undelayed pulse comes through Q210 from the TRIGGER OUTPUT circuits. Section 6, diagram 2, sheet 3.

4–24 In the WIDTH TRIG and EXT WIDTH modes, Q209 under control of switch S1.3 reverse biases Q210 thereby preventing the undelayed pulse from reaching the width circuits.

4–25 PULSE WIDTH

4–26 The purpose of the pulse width circuit is to produce pulses of variable width in response to delayed and undelayed pulses. The variable width pulses are produced by triggering a monostable circuit.

4–27 The monostable circuit consists of Schmitt trigger Q401, Q402, Q403, ramp generator Q407, C401 C402 and the ramp discharge path through Q404. The monostable functions in exactly the same manner as does the pulse delay monostable (paragraph 4–15). The output is amplified by differential amplifier Q405/Q406 and applied to the input of the phase selection circuit on assembly A2.

4–28 PHASE SELECTION

4–29 Either the output of the width circuit or an external width signal is applied to the differential amplifier Q501, 502. The complementary outputs are amplifier by Q503, 504. Diodes CR501 through CR506 and and transistors Q505 through Q508, under control of the SYMM. NORM. COMPL. switch and the POLARITY switch, select one of the complementary signals for further processing.

4–30 Phase selection determines whether the leading edge of the output pulse is positive-going or negative-going. The SYMM. NORM. COMPL. and POLARITY switches also control K1 which switches the leading and trailing edge verniers to their appropriate circuits.

4–31 TRANSISTION TIME

4–32 Schmitt trigger MC601 produces a clean and stable pulse and pulse complement which are amplified by differential amplifiers Q601/Q602 and Q607/Q608. The positive-going edge of the pulse at collector Q603 (be it leading or trailing edge) is integrated by C607/C608 and the current source in the emitter circuit of Q603. The negative-going edge is integrated by C607/C608 and current source in the emitter circuit of Q605.

4–33 CLIPPING AND LIMITING

4–34 The output of the transition time circuits is clipped by clipping diodes CR605/606. Clipping is adjusted to provide an output from MC701 that contains no step. See figure 4–5. Too little clipping provides too great an input to the limiter MC701, which causes excessive rolloff of the output pulse. See figure 4–6 for a description of rolloff. Too much clipping provides the limiter with too small an input and a step will appear on signals at the output.

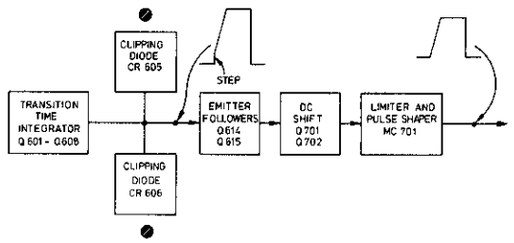


Figure 4–5. Clipping and Limiting

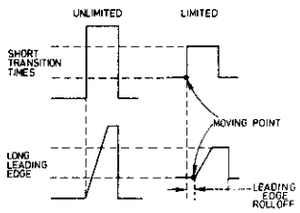


Figure 4–6. Rolloff

4–35 POLARITY

4–36 The POLARITY switch S11.1 and the SYMM. NORM. COMPL. switch S10.1 control the Q715/Q716 collector voltage. A positive collector voltage will make the output pulses positive. See figure 4–7 and paragraph 4–28.

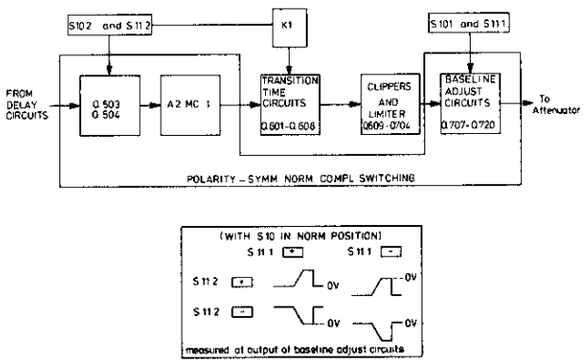


Figure 4–7. Polarity and Format Switching

4–37 BASELINE ADJUST

4–38 The current through Q713 is adjusted so that the most positive level of negative pulses is zero volts. Q716 current is adjusted so that the most negative level of positive pulses is zero volts.

4–39 OFFSET

4–40 Q801 through Q810 provide the offset voltage for the output pulses. See diagram 9, section 6.

5–1 GENERAL

5–2 The maintenance section contains three groups of checking procedures: preliminary checks, performance checks and internal checks and adjustments. If performance of the preliminary checks reveals no malfunctions, the instrument is in reasonable working order.

5–3 The performance checks are designed to assure that the intruments is performing to specifications. See table 1–1. If the performance checks reveal any deviation from the specifications, the internal checks and adjustments may be required.

5–4 REMOVAL OF COVERS AND ASSEMBLIES

5–5 Access to Test Points and Assemblies

5–6 Access to all test points and assemblies is through the removal of the top and bottom covers. These may be removed by releasing the 2 screws in the respective cover and sliding it to the rear.

5–7 Removal of Assemblies

5–8 With reference to diagram 2, section 6, it will be seen that assemblies A1, A2 and A3 are plug-in assemblies secured by screws. The attenuator vernier assembly (A7) is mechanically secured to assembly A4 by 3 screws which can be removed without further dismantling the instrument. To gain access to assemblies A4 and A5 switch contacts, remove the right-hand side frame and remove the assembly securing screws, the assemblies can be removed.

Table 5–1. Test Equipment and Accessories

INSTRUMENT	BRIEF SPECIFICATION	RECOMMENDED MODEL
Counter	Frequency range 0 – 350 MHz with period, ext. time base and ext. start/stop facilities.	HP 5245L with plug-in 5252A
Oscilloscope	Dual-channel, 50 MHz bandwidth, 5mV/div sensitivity, sweep speeds 5nS/div to 2S/div.	HP 180A with plug-ins 1801A, 1821A
Power Supply	+6V at not less than 60mA.	HP 6200 Series
Digital Voltmeter	10V dc range to 4 significant figures. Accuracy ± 0.05% ± 1 digit.	HP 3440A with plug-in 3444A
Ac Voltmeter	Sensitivity 100μV to 300V rms.	HP 403B.
Sampling Oscilloscope	Dual-channel, 1 GHz bandwidth, 1mV/div sensitivity, sweep speeds 10pS/div to 2S/div.	HP 140A with plug-ins 1410A, 1424A
Pulse Generator	Rep. rates 3 Hz to 10 MHz, 30nS pulse width, variable amplitude between ± 2V, fast rise and fall times (5ns)	HP 8003A

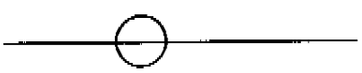
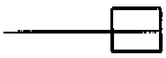
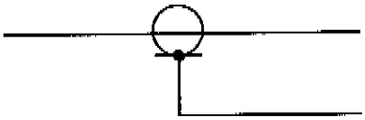
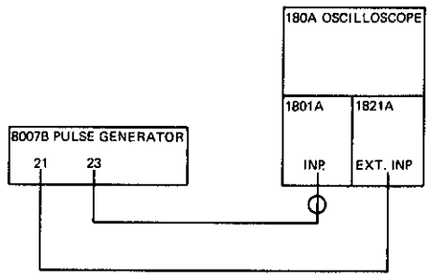
ACCESSORIES	SYMBOLS USED IN THIS SECTION	RECOMMENDED MODEL
50Ω feed-through termination		HP 11048B
50Ω cable assembly with male BNC connectors (4 required)		HP 10120A
20dB Co-axial attenuator		HP 8491A
50Ω T connector, type GR		HP 10221A
50Ω Termination, type GR		GR 874 – W50B
50Ω Cable Assembly with male BNC connector and dual banana plug		HP 11001A
Probe divider 10:1		HP 10214A

Table 5–2. Preliminary Check: Internal Operation

INITIAL CONTROL SETTINGS	
PULSE PERIOD **2**	3μ – .1m
VERNIER **3**	CCW
PULSE DELAY **4**	1.5μ – 50μ
VERNIER **5**	CCW
PULSE WIDTH **6**	1.5μ – 50μ
VERNIER **7**	CCW
TRANSITION TIME **8**	0.1μ – 5μ
LEADING EDGE **9**	CCW
TRAILING EDGE **10**	CCW
AMPLITUDE **11**	2.5 – 5
VERNIER **12**	CW
OFFSET **13**	ON
VERNIER **14**	Mid-range
Mode selector **15**	NORM
DOUBLE PULSE/DELAY **17**	DELAY
SYMM. NORM. COMPL. **22**	NORM
PULSE POLARITY **24**	+

TEST SET–UP



The purpose of this preliminary check is to establish whether the instrument produces pulses of approximately the right dimensions in the normal mode.

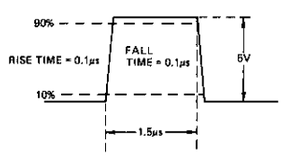
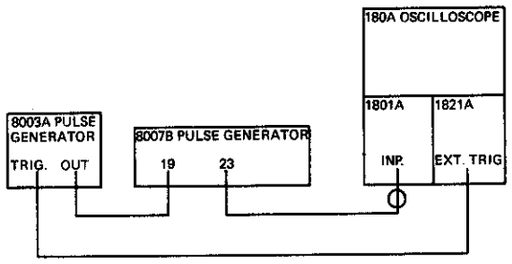
STEP	INSTRUCTIONS	RESULTS
1	Set up the instruments as shown above.	

Table 5–3. Preliminary Check: External Operation



INITIAL CONTROL SETTINGS	
PULSE PERIOD 2	3μ – .1m
VERNIER 3	Mid-range
PULSE DELAY 4	1.5μ – 50μ
VERNIER 5	Mid-range
PULSE WIDTH 6	1.5μ – 50μ
VERNIER 7	Mid-range
TRANSITION TIME 8	0.1μ – 5μ
LEADING EDGE 9	CCW
TRAILING EDGE10	CCW
AMPLITUDE 11	1 – 2.5
VERNIER 12	CW
OFFSET 13	ON
VERNIER 14	Mid-range
Mode selector 15	GATE
EXT. LEVEL 16	+0.5 (approx.)
DOUBLE PULSE/DELAY 17	DELAY
SLOPE/POLARITY 20	+
SYMM. NORM. COMPL. 22	+
PULSE POLARITY 24	NORM

The purpose of this preliminary check is to determine whether the instrument produces pulses of approximately the right dimensions in the four external modes of operation.

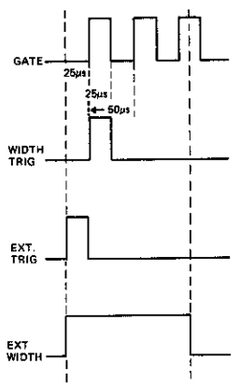
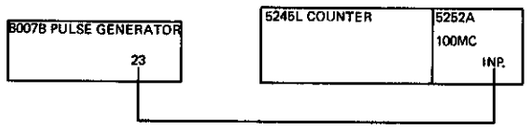
STEP	INSTRUCTION	RESULTS
1	Set up the instruments as shown above.	—
2	Adjust the 8003A to deliver a 200μs positive pulse.	
3	Set the 8007B mode selector to EXT. TRIG.	
4	Set the 8007B mode selector to WIDTH TRIG.	
5	Set the 8007B mode selector to EXT WIDTH.	

Table 5–4. Preliminary Check; Manual Operation

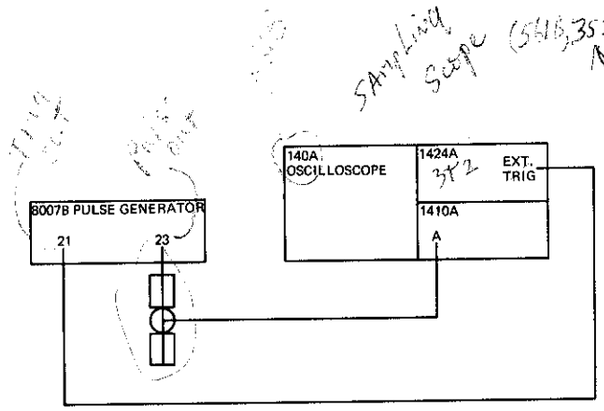
INITIAL CONTROL SETTINGS

PULSE DELAY 2	MAN
VERNIER 3	Mid-range
PULSE DELAY 4	1.5μ – 5μ
VERNIER 5	Mid-range
PULSE WIDTH 6	1.5μ – 50μ
VERNIER 7	Mid-range
TRANSITION TIME 8	0.1μ – 5μ
LEADING EDGE 9	CCW
TRAILING EDGE 10	CCW
AMPLITUDE 11	1 – 2.5
VERNIER 12	CW
OFFSET 13	ON
VERNIER 14	Mid-range
Mode selector 15	NORM
DOUBLE PULSE/DELAY 17	DELAY
SYMM. NORM. COMPL. 22	NORM
PULSE POLARITY 24	+



STEP	INSTRUCTIONS	RESULTS
1	Press the 8007B MANUAL push-button 1 ten times.	The counter reads 5. Note: The 5252A plug-in is a divider that counts every other pulse.

Table 5–5. Performance Check: Transition Times (minimum)



INITIAL CONTROL SETTINGS

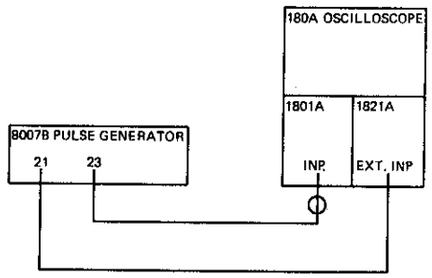
PULSE PERIOD **2**	10n – .1μ
VERNIER **3**	CW
PULSE DELAY **4**	5n – 50n
VERNIER **5**	CCW
PULSE WIDTH **6**	5n – 50n
VERNIER **7**	CW
TRANSITION TIME **8**	2n – 0.1μ
LEADING EDGE **9**	CCW
TRAILING EDGE **10**	CCW
AMPLITUDE **11**	2.5 – 5
VERNIER **12**	CW
OFFSET **13**	OFF
Mode selector **15**	NORM
DOUBLE PULSE/DELAY **17**	DELAY
SYMM. NORM. COMPL. **22**	SYMM
PULSE POLARITY **24**	+

STEP	INSTRUCTIONS	RESULTS
1	Adjust the 1424A sensitivity for full screen display, set to EXPAND.	—
2	Vary VERNIER **5** to center the pulse leading edge on the screen. Measure the rise time:	< 2ns
3	Vary VERNIER **5** to center the pulse trailing edge on the screen. Measure the fall time:	< 2ns
4	Set the SYMM. NORM. COMPL. switch to NORM. Measure the rise and fall times for a negative and positive pulse.	< 2ns

Table 5–6. Performance Check: Transition Times (greater than 2ns)

INITIAL CONTROL SETTINGS

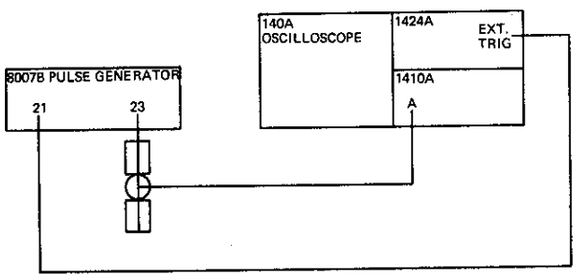
PULSE PERIOD **2**	.1μ – 3μ
VERNIER **3**	CW
PULSE DELAY **4**	5n – 50n
VERNIER **5**	CCW
PULSE WIDTH **6**	50n – 1.5μ
VERNIER **7**	CW
TRANSITION TIME **8**	2n – 0.1μ
LEADING EDGE **9**	CW
TRAILING EDGE **10**	CW
AMPLITUDE **11**	2.5 – 5
VERNIER **12**	CW
OFFSET **13**	OFF
Mode selector **15**	NORM
DOUBLE PULSE/DELAY **17**	DELAY
SYMM. NORM. COMPL. **22**	SYMM
PULSE POLARITY **24**	+



Check the transition times with the controls set as shown below. For each setting, center the leading and then the trailing edge on the screen by means of the pulse delay VERNIER **5**.

TRANSITION TIME **8**	PULSE WIDTH **6** PULSE DELAY **4**	PULSE PERIOD **2**	LEADING EDGE **9** TRAILING EDGE **10**	RESULT
2n – .1μ	50n – 1.5μ	.1μ – 3μ	CW	> .1μs
.1μ – 5μ	50n – 1.5μ	.1μ – 3μ	CCW	< .1μs
.1μ – 5μ	1.5μ – 50μ	3μ – .1m	CW	> 5μs
5μ – 250μ	1.5μ – 50μ	3μ – .1m	CCW	< 5μs
5μ – 250μ	50μ – 1.5m	.1m – 3m	CW	> 250μs

Table 5–7. Performance Check: Linearity



INITIAL CONTROL SETTINGS

PULSE PERIOD 2	10n –.1μ
VERNIER 3	CW
PULSE DELAY 4	5n – 50n
VERNIER 5	CCW
PULSE WIDTH 6	5n – 50n
VERNIER 7	CW
TRANSITION TIME 8	2n – 0.1μ
LEADING EDGE 9	Mid-range
TRAILING EDGE 10	Mid-range
AMPLITUDE 11	2.5 – 5
VERNIER 12	CW
OFFSET 13	OFF
Mode selector 15	NORM
DOUBLE PULSE/DELAY 17	DELAY
SYMM. NORM. COMPL. 22	SYMM
PULSE POLARITY 24	+

STEP	INSTRUCTIONS	RESULTS
1	Adjust LEADING EDGE **9** for a rise time of 20ns. Measure the linearity deviation.	Deviation from a straight line between the 10% and 90% points. Should not exceed 5% of the peak voltage.
2	Adjust TRAILING EDGE **10** for a fall time of 20ns. Measure the linearity deviation.	

See Table 1-1 specs.

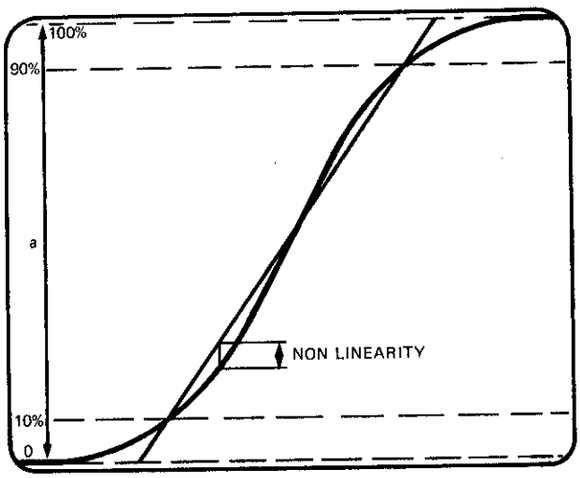
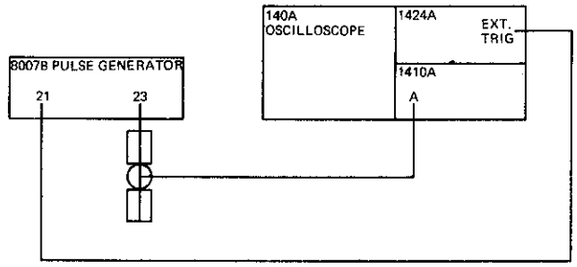


Table 5–8. Performance Check: Preshoot, Overshoot and Ringing

INITIAL CONTROL SETTINGS

PULSE PERIOD 2	10n – .1μ
VERNIER 3	CW
PULSE DELAY 4	5n – 50n
PULSE WIDTH 5	5n – 50n
VERNIER 6	CCW
VERNIER 7	CW
TRANSITION TIME 8	2n – 0.1μ
LEADING EDGE 9	CCW
TRAILING EDGE 10	CCW
AMPLITUDE 11	2.5 – 5
VERNIER 12	CW
OFFSET 13	OFF
Mode selector 15	NORM
DOUBLE PULSE/DELAY 17	DELAY
SYMM. COMPL. NORM. 22	SYMM
PULSE POLARITY 24	+



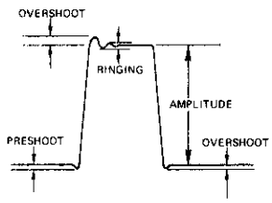
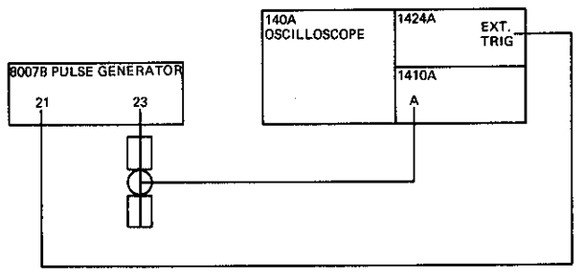
STEP	INSTRUCTIONS	RESULTS
1	Measure preshoot, overshoot and ringing in turn.	< 5% of pulse amplitude in each case.
2	Switch PULSE POLARITY to (–) . Check preshoot, overshoot and ringing of negative pulse.	

Table 5–9. Performance Check: Pulse Width (less than 50ns)



INITIAL CONTROL SETTINGS

PULSE PERIOD 2	10n – .1μ
VERNIER 3	CW
PULSE DELAY 4	5n – 50n
VERNIER 5	CCW
PULSE WIDTH 6	5n – 50n
VERNIER 7	CCW
TRANSITION TIME 8	2n – 0.1μ
LEADING EDGE 9	CCW
TRAILING EDGE 10	CCW
AMPLITUDE 11	2.5 – 5
VERNIER 12	CW
OFFSET 13	OFF
Mode selector 15	NORM
DOUBLE PULSE/DELAY 17	DELAY
SYMM. NORM. COMPL. 22	SYMM
PULSE POLARITY 24	+

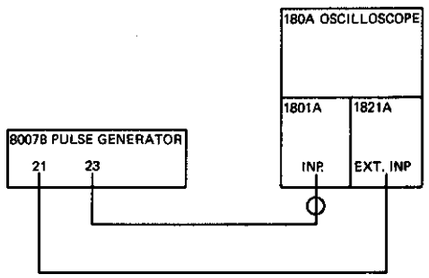
Check the pulse width with the controls set as shown below.

PULSE WIDTH 6	VERNIER 7	PULSE POLARITY 24	RESULTS
5n – 50n	CCW	+ and –	< 5ns
5n – 50n	CW	+ and –	> 50ns
50n – 1.5μ	CCW	+ and –	< 50ns

Table 5–10. Performance Check : Pulse Width (greater than 50ns)

INITIAL CONTROL SETTINGS

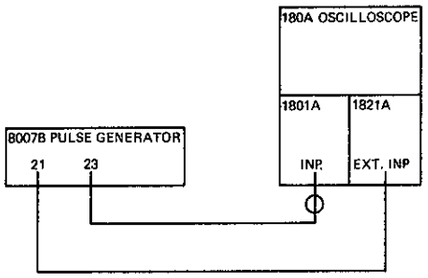
PULSE PERIOD 2	.1μ – 3μ
VERNIER 3	CW
PULSE DELAY 4	5n – 50n
VERNIER 5	CCW
PULSE WIDTH 6	50n – 1.5μ
VERNIER 7	CW
TRANSITION TIME 8	2n – 0.1μ
LEADING EDGE 9	CCW
TRAILING EDGE 10	CCW
AMPLITUDE 11	1 – 2.5
VERNIER 12	CW
OFFSET 13	OFF
Mode selector 15	NORM
DOUBLE PULSE/DELAY 17	DELAY
SYMM. NORM. COMPL. 22	SYMM
PULSE POLARITY 24	+



Check the pulse width with the controls set as shown below.

PULSE WIDTH 6	VERNIER 7	PULSE PERIOD 2	RESULTS
50n – 1.5μ	CW	.1μ – 3μ	> 1.5μs
1.5μ – 50μ	CCW	.1μ – 3μ	< 1.5μs
1.5μ – 50μ	CW	3μ – .1m	> 50 μs
50μ – 1.5m	CCW	3μ – .1m	< 50μ
50μ – 1.5m	CW	.1m – 3m	> 1.5ms
1.5m – 50m	CCW	.1m – 3m	< 1.5ms
1.5m – 50m	CW	3m – .1	> 50ms

Table 5–11. Performance Check: Pulse Width Jitter



INITIAL CONTROL SETTINGS

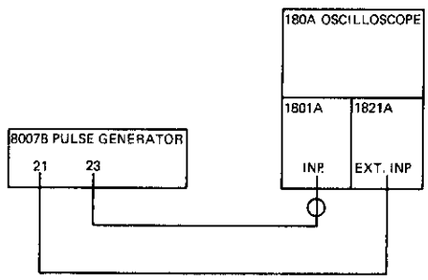
PULSE PERIOD 2	.1m – 3m
VERNIER 3	CCW
PULSE DELAY 4	5n – 50n
VERNIER 5	CCW
PULSE WIDTH 6	50μ – 1.5m
VERNIER 7	CCW
TRANSITION TIME 8	2n – 0.1μ
LEADING EDGE 9	CCW
TRAILING EDGE 10	CCW
AMPLITUDE 11	1 – 2.5
VERNIER 12	CW
OFFSET 13	OFF
Mode selector 15	NORM
DOUBLE PULSE/DELAY 17	DELAY
SYMM. NORM. COMPL. 22	SYMM
PULSE POLARITY 24	+

STEP	INSTRUCTIONS	RESULT
1	Adjust the pulse width VERNIER **7** for a pulse of 50μs width.	
2	Adjust the 1821A TIME/DIV control and DELAY (DIV) control so that the intensified portion of the main sweep coincides with the trailing edge of the pulse.	
3	Set the 1821A Sweep Display switch to DELAYED and center the trailing edge by adjusting the DELAY (DIV) control.	
4	Set the 180A Magnifier to X5.	Pulse Jitter < 50ns.

Table 5–12. Performance Check: Maximum Duty Cycle

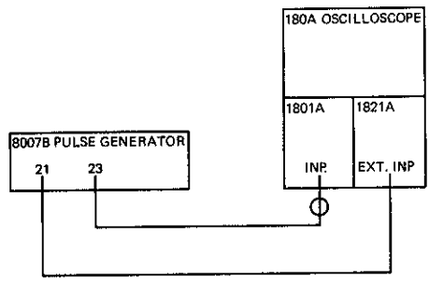
INITIAL CONTROL SETTINGS

PULSE PERIOD **2**	3μ – .1m
VERNIER **3**	CW
PULSE DELAY **4**	5n – 50n
VERNIER **5**	CCW
PULSE WIDTH **6**	50μ – 1.5m
VERNIER **7**	CCW
TRANSITION TIME **8**	2n – 0.1μ
LEADING EDGE **9**	CCW
TRAILING EDGE **10**	CCW
AMPLITUDE **11**	2.5 – 5
VERNIER **12**	CW
OFFSET **13**	OFF
Mode selector **15**	NORM
DOUBLE PULSE/DELAY **17**	DELAY
SYMM. NORM. COMPL. **22**	SYMM
PULSE POLARITY **24**	+



STEP	INSTRUCTIONS	RESULT
1	Turn the pulse width VERNIER slowly CW until the pulse period is affected (count down) and calculate the duty cycle at that pulse width.	> 50% "on time"

Table 5–13. Performance Check: Amplitude



INITIAL CONTROL SETTINGS

PULSE PERIOD **2**	.1m – 3m
VERNIER **3**	CCW
PULSE DELAY **4**	5n – 50n
VERNIER **5**	CCW
PULSE WIDTH **6**	50μ – 1.5m
VERNIER **7**	CCW
TRANSITION TIME **8**	2n – 0.1μ
LEADING EDGE **9**	CCW
TRAILING EDGE **10**	CCW
AMPLITUDE **11**	2.5 – 5
VERNIER **12**	CW
OFFSET **13**	OFF
Mode selector **15**	NORM
DOUBLE PULSE/DELAY **17**	5n – 50n
SYMM. NORM. COMPL. **22**	SYMM
PULSE POLARITY **24**	+

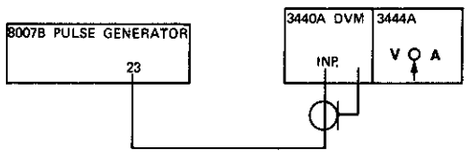
Check the pulse amplitude with the controls set as shown below. Repeat test with the PULSE POLARITY switch 24 set to (–).

AMPLITUDE **11**	VERNIER **12**	RESULTS
5 – 2.5	CW	>5.0V
5 – 2.5	CCW	<2.5V
2.5 – 1	CW	>2.5V
2.5 – 1	CCW	<1.0V
1 – .5	CW	>1.0V
1 – .5	CCW	<0.5V
.5 – .2	CW	>0.5V
.5 – .2	CCW	<0.2V

Table 5–14. Performance Check: Source Impedance

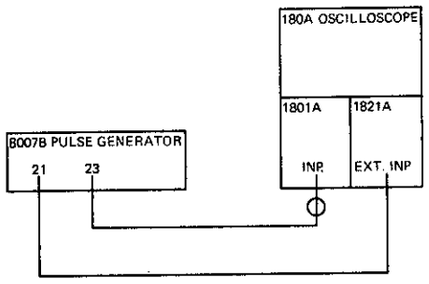
INITIAL CONTROL SETTINGS

PULSE PERIOD **2**	3μ – .1m
VERNIER **3**	Mid-range
PULSE DELAY **4**	1.5μ – 50μ
VERNIER **5**	Mid-range
PULSE WIDTH **6**	1.5μ–50 μ
VERNIER **7**	Mid-range
TRANSITION TIME **8**	0.1μ – 5μ
LEADING EDGE **9**	CCW
TRAILING EDGE **10**	CCW
AMPLITUDE **11**	2.5 – 5
VERNIER **12**	CW
OFFSET **13**	ON
Mode selector **15**	NORM
DOUBLE PULSE/DELAY **17**	DELAY
LINE **18**	OFF
SYMM. NORM. COMPL. **22**	SYMM
PULSE POLARITY **24**	+



STEP	INSTRUCTIONS	RESULTS
1	Check the source impedance with VERNIER **12** CW and then CCW.	50Ω± 4Ω

Table 5–15. Performance Check: Offset



INITIAL CONTROL SETTINGS

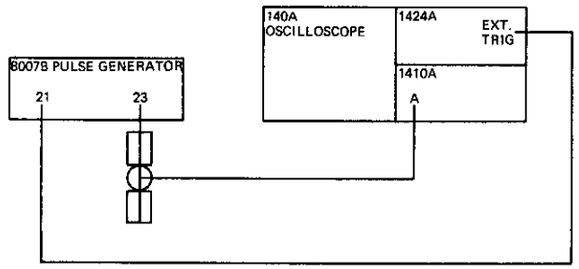
PULSE PERIOD **2**	3μ – .1m
VERNIER **3**	Mid-range
PULSE DELAY **4**	1.5μ – 50μ
VERNIER **5**	Mid-range
PULSE WIDTH **6**	1.5μ –50μ
VERNIER **7**	Mid-range
TRANSITION TIME **8**	.1μ – 5μ
LEADING EDGE **9**	CCW
TRAILING EDGE **10**	CCW
AMPLITUDE **11**	OFF
VERNIER **12**	CW
OFFSET **13**	OFF
VERNIER **14**	CW
Mode selector **15**	NORM
DOUBLE PULSE/DELAY **17**	DELAY
SYMM. NORM. COMPL. **22**	SYMM
PULSE POLARITY **24**	+

STEP	INSTRUCTIONS	RESULTS
1	Center the oscilloscope trace	—
2	Switch OFFSET **13** on and measure the baseline potential.	> +4V
3	Turn VERNIER **14** CCW and measure the baseline potential.	> –4V
4	Switch the AMPLITUDE selector 11 to 2.5 – 5 and check the baseline potential with VERNIER **14** at both extremities.	> +4V and > –4V

Table 5–16. Performance Check: Pulse Delay (less than 0.5μS)

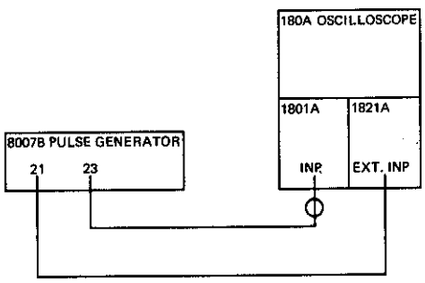
INITIAL CONTROL SETTINGS

PULSE PERIOD 2	.1μ – 3μ
VERNIER 3	CW
PULSE DELAY 4	5n – 50n
VERNIER 5	CCW
PULSE WIDTH 6	5n – 50n
VERNIER 7	CW
TRANSITION TIME 8	2n – 0.1μ
LEADING EDGE 9	CCW
TRAILING EDGE 10	CCW
AMPLITUDE 11	2.5 – 5
VERNIER 12	CW
OFFSET 13	OFF
Mode selector 15	NORM
DOUBLE PULSE/DELAY 17	DELAY
SYMM. NORM. COMPL. 22	SYMM
PULSE POLARITY 24	+



STEP	INSTRUCTIONS	RESULTS
1	Observe the position of the pulse's leading edge. Regard this position as 30ns from the trigger.	—
2	Turn VERNIER 10 CW.	Pulse delay > 75ns
3	Set PULSE DELAY 9 to 50n – 1.5μ and turn VERNIER 10 CCW.	Pulse delay < 75ns.

Table 5–17. Performance Check: Pulse Delay (more than 50nS)



INITIAL CONTROL SETTINGS

PULSE PERIOD 2	3μ – .1m
VERNIER 3	CW
PULSE DELAY 4	5n – 50n
VERNIER 5	CCW
PULSE WIDTH 6	5n – 50n
VERNIER 7	CW
TRANSITION TIME 8	2n –.1μ
LEADING EDGE 9	CCW
TRAILING EDGE 10	CCW
AMPLITUDE 11	2.5 – 5
VERNIER 12	CW
OFFSET 13	OFF
Mode selector 15	NORM
DOUBLE PULSE/DELAY 17	DELAY
SYMM. NORM. COMPL. 22	SYMM
PULSE POLARITY 24	+

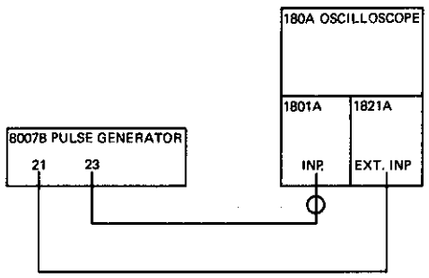
STEP	INSTRUCTIONS
1	Observe the position of the pulse's leading edge. Regard this position as 30ns from the trigger.
2.	Measure the pulse delay with the controls set as shown below.

PULSE DELAY 4	VERNIER 5	PULSE PERIOD 2	PULSE WIDTH 6	RESULTS
50n – 1.5μ	CW	3μ – .1m	1.5μ – 50μ	>1.5μs
1.5μ – 50μ	CCW	3μ – .1m	1.5μ – 50μ	< 1.5μs
1.5μ – 50μ	CW	.1m –	50 μ – 1.5m	> 50μs
50μ – 1.5m	CCW	.1m – 3m	50 μ – 1.5m	< 50μs
50μ – 1.5m	CW	.1m – 3m	50μ – 1.5m	> 1.5ms
1.5m – 50m	CCW	3m – .1	1.5m – 50m	< 1.5ms
1.5m – 50m	CW	3m – .1	1.5m – 50m	> 50ms

Table 5–18. Performance Check: Pulse Delay Jitter

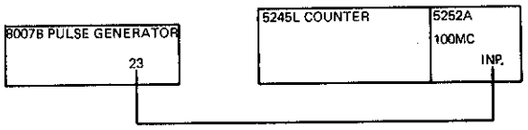
INITIAL CONTROL SETTINGS

PULSE PERIOD 2	.1m – 3m
VERNIER 3	CW
PULSE DELAY 4	50μ – 1.5m
VERNIER 5	CCW
PULSE WIDTH 6	1.5μ – 50μ
VERNIER 7	CW
TRANSITION TIME 8	2n – 0.1μ
LEADING EDGE 9	CCW
TRAILING EGE 10	CCW
AMPLITUDE 11	1 – 2.5
VERNIER 12	CW
OFFSET O 13	OFF
Mode selector 15	NORM
DOUBLE PULSE/DELAY 17	DELAY
SYMM. NORM. COMPL. 22	SYMM
PULSE POLARITY 24	+



STEP	INSTRUCTIONS	RESULTS
1	Adjust the distance between the delayed and the undelayed pulse to 50μs by means of VERNIER 5.	
2	Adjust the 1821A TIME/DIV control and DELAY (DIV) control so that the intensified portion of the main sweep coincides with the leading edge of the delayed pulse.	
3	Switch the 1821A Sweep Display switch to MIXED and the 180A Magnifier to X5.	Pulse Jitter < 50ns.

Table 5–19. Performance Check: Pulse Period (Rep. Rate)



INITIAL CONTROL SETTINGS

RATE 2	100M – 10M
VERNIER 3	CCW
PULSE DELAY 4	5n – 50n
VERNIER 5	CCW
PULSE WIDTH 6	5n – 50n
VERNIER 7	CCW
TRANSITION TIME 8	2n – 0.1μ
LEADING EDGE 9	CCW
TRAILING EDGE 10	CCW
AMPLITUDE 11	2.5 – 5.0
VERNIER 12	CW
OFFSET 13	OFF
Mode selector 15	NORM
DOUBLE PULSE/DELAY 17	DELAY
SYMM. NORM. COMPL. 22	SYMM
PULSE POLARITY 24	+

Check the repetition rate with the controls set as shown below.

RATE 2	VERNIER 3	RESULTS
100M – 10M	CCW	> 100MHz 10ns
100M – 10M	CW	< 10MHz 0.1μs
10M – .3M	CCW	> 10MHz
10M – .3M	CW	< .3MHz 3μs
.3M – 10K	CCW	> .3MHz
.3M – 10K	CW	< 10 kHz 0.1ms
10K – .3K	CCW	> 10kHz
10K – .3K	CW	< .3kHz 3ms
.3K – 10	CCW	> .3kHz
.3K – 10	CW	< 10 Hz .1sec

Set ready 1 shot 1

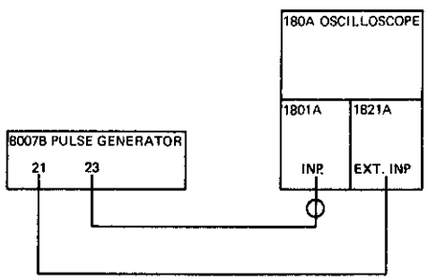
.3 here is = to

.3333

Table 5–20. Performance Check: Pulse Period Jitter

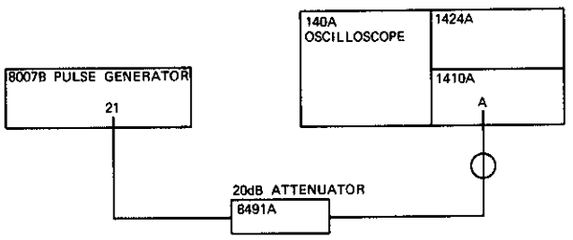
INITIAL CONTROL SETTINGS

PULSE PERIOD 2	.1m – 3m
VERNIER 3	CCW
PULSE DELAY 4	5n – 50n
VERNIER 5	CCW
PULSE WIDTH 6	1.5μ – 50μ
VERNIER 7	CW
TRANSITION TIME 8	2n – 0.1μ
LEADING EDGE 9	CCW
TRAILING EDGE 10	CCW
AMPLITUDE 11	2.5 – 5.0
VERNIER 12	CW
OFFSET 13	OFF
Mode selector 15	NORM
DOUBLE PULSE/DELAY 17	DELAY
SYMM. NORM. COMPL. 22	SYMM
PULSE POLARITY 24	+



STEP	INSTRUCTIONS	RESULT
1	Adjust the oscilloscope to display to pulses.	
2	Adjust the 1821A TIME/DIV control and DELAY (DIV) control so that the intensified portion of the main sweep coincides with the leading edge of the second pulse displayed.	
3	Set the 1821A Sweep Display switch to DELAYED and center the leading edge by adjusting the DELAY (DIV) control.	Pulse Jitter < 100ns.

Table 5–21. Performance Check: Trigger Output



INITIAL CONTROL SETTINGS

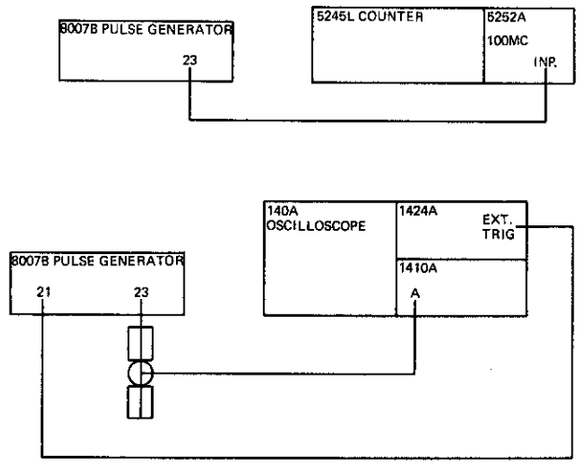
PULSE PERIOD 2	10n – .1μ
VERNIER 3	CW
PULSE DELAY 4	5n – 50n
VERNIER 5	CCW
PULSE WIDTH 6	5n – 50n
VERNIER 7	CCW
TRANSITION TIME 8	2n – 0.1μ
LEADING EDGE 9	CCW
TRAILING EDGE 10	CCW
AMPLITUDE 11	2.5 – 5
VERNIER 12	CW
OFFSET 13	OFF
Mode selector 15	NORM
DOUBLE PULSE/DELAY 17	DELAY
SYMM. NORM. COMPL. 22	SYMM
PULSE POLARITY 24	+

STEP	INSTRUCTIONS	RESULTS
1	Measure trigger amplitude	> 1V
2	Measure trigger width.	4ns ± 2ns

Table 5–22. Internal Checks and Adjustments: Timing Board A1

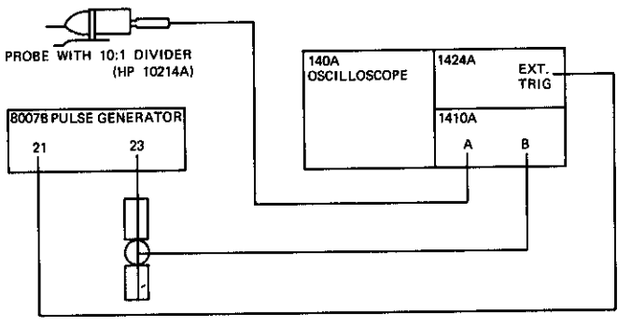
INITIAL CONTROL SETTINGS

PULSE PERIOD 2	10n – .1μ
VERNIER 3	CCW
PULSE DELAY 4	5n – 50n
VERNIER 5	CCW
PULSE WIDTH 6	5n – 50n
VERNIER 7	CCW
TRANSITION TIME 8	2n – 0.1μ
LEADING EDGE 9	CCW
TRAILING EDGE 10	CCW
AMPLITUDE 11	2.5 – 5
VERNIER 12	CW
OFFSET 13	OFF
Mode selector 15	NORM
DOUBLE PULSE/DELAY 17	DELAY
SYMM. NORM. COMPL. 22	SYMM
PULSE POLARITY 24	+



STEP	INSTRUCTIONS	ADJUST	RESULT
1	Connect the equipment as shown in TEST SET–UP 1.		
2	Measure the pulse period:	A1C3	105 MHz
3	Connect the equipment as shown in TEST SET–UP 2.		
4	Turn VERNIER **3** and VERNIER **7** fully CW.		
5	Measure the pulse width:	A1C402	60ns
6	Turn VERNIER **7** fully CCW and VERNIER **5** fully CW		
7	Measure the pulse delay variation:	A1C302	55ns

Table 5–23. Internal Checks and Adjustments: Output Board A2



INITIAL CONTROL SETTINGS

PULSE PERIOD 2	.1μ – 3μ
VERNIER 3	—
PULSE DELAY 4	50n – 1.5μ
VERNIER 5	CCW
PULSE WIDTH 6	50n – 1.5μ
TRANSITION TIME 8	2n – .1μ
LEADING EDGE 9	CW
TRAILING EDGE 10	CCW
AMPLITUDE 11	2.5 – 5
VERNIER 12	CW
OFFSET 13	OFF
Mode selector 15	NORM
DOUBLE PULSE/DELAY 17	DELAY
SYMM. NORM. COMPL. 22	NORM
PULSE POLARITY 23	+

LIMITERS ADJUSTMENT

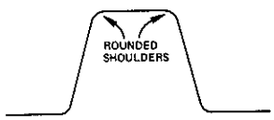
1. Adjust VERNIER **3** for a pulse period of 600ns.
2. Adjust VERNIER **7** for a pulse width of 300ns.
3. With probe on 8007B ground, set the channel A trace to the center of the graticule.
4. With probe on test point 1 (see diagram 9 in section 6), adjust oscilloscope for a single pulse.
5. Adjust R639 to clip off the vertical portion of the leading edge. This adjustment should result in a maximum of 10ns rolloff of the leading edge when VERNIER **9** is turned from one extremity to the other. See figure 4–8 for a description of rolloff.
6. Turn leading edge VERNIER **9** CCW and trailing edge VERNIER **10** CW.
7. Adjust R632 to clip off the vertical portion of the trailing edge. This adjustment should result in a maximum of 10ns rolloff of the trailing edge when VERNIER **10** is turned from one extremity to the other.
8. Turn trailing edge VERNIER **10** CCW.
9. Adjust R724 so that the pulse is symmetrical to ground (center of the graticule).

POSITIVE/NEGATIVE BASELINE ADJUST

10. Set AMPLITUDE **11** to off.
11. Turn channel A trace out of view; set channel B trace to center of graticule.
12. Set AMPLITUDE **11** to the 2.5 to 5V position. Set R760 and R765 CW.
13. Adjust R760 so that the baseline of the pulse is centered on the graticule.
14. Switch PULSE POLARITY **24** to (–).
15. Adjust R765 so that the baseline of the pulse is centered on the graticule.

SHOULDER ADJUST

16. Turn both transition time VERNIERS **9** and **10** CW.
17. Adjust R732 for maximum sharpness of the pulse corners.



ROLLOFF SYMMETRY ADJUST

18. Turn both transition time VERNIERS **9** and **10** CCW.
19. Measure the rolloff of the leading edge by turning VERNIER **9** from one extreme to the other.
20. Measure the rolloff of the trailing edge by turning VERNIER **10** from one extreme to the other.
21. Adjust R724 to increase the smaller of the two measurements (steps 19 and 20) by one half of the difference between the two.
22. Repeat steps 19, 20 and 21 until the leading edge and trailing edge rolloff are equal.

SECTION 6

DIAGRAMS

6–1 GENERAL

6–2 This section contains circuit diagrams and component location diagrams for use in repairing the instrument. Included on the circuit diagrams are a number of waveforms to assist the repairman in localizing a fault.

6–3 Also included in this section is parts ordering information. The parts list for an assembly is located on the same page or near the component location diagram for that assembly. To order a replacement part, address an order of inquiry either to your authorized Hewlett-Packard sales representative or to:

CUSTOMER SERVICE
Hewlett-Packard Company
333 Logue Avenue
Mountain View, California 94049

or, in Western Europe, to:

Hewlett-Packard (Schweiz) AG
Rue du Bois-du-Lan 7
1217 Meyrin 2
Geneva

6–4 Specify the following information for each part:

Model and complete serial number of instrument.

Hewlett-Packard stock number of the part.

Circuit reference designator.

Description

6–5 To order a part not listed, give a complete description of the part and include its function and location.

Table 6–1. A guide to the diagrams

Diagram 1	8007B Assembly location and interconnection diagrams Parts List: Frame
Diagram 2 Sheet 1	Assembly A1: Component Layout Parts List Circuit Diagram Part 1
Diagram 2 Sheet 2	Assembly A1: Circuit Diagram Part 2
Diagram 2 Sheet 3	Assembly A1: Circuit Diagram Part 3
Diagram 3 Sheet 1	Assembly A2: Component Layout Parts List Circuit Diagram Part 1
Diagram 3 Sheet 2	Assembly A2: Circuit Diagram Part 2
Diagram 4:	Assemblies A4 and A7: Component Layout Parts List Circuit Diagram
Diagram 5:	Assembly A5: Component Layout Parts List Circuit Diagram
Diagram 6:	Assemblies A3 and A6: Component Layout Parts List Circuit Diagram

Table 6–2. Reference Designators

A = assembly	F = fuse	P = plug	V = vacuum tube, neon
B = motor	FL = filter	Q = transistor	bulb, photocell, etc.
BT = battery	HR = heater	R = resistor	VR = voltage regulator
C = capacitor	J = jack	RT = thermistor	W = cable
CP = coupler	K = relay	S = switch	X = socket
CR = diode	L = inductor	T = transformer	Y = crystal
DL = delay line	M = meter	TB = terminal board	
DS = lamp	MC = micro-cirucit	TP = test point	

Table 6–3. Circuit Diagram Notes

Refer to MIL–STD–15–1 for schematic symbols not listed in this table.

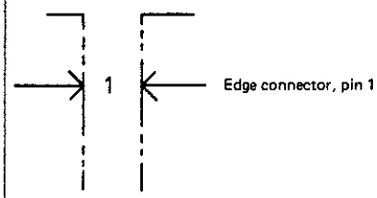
Unless other indicated:
capacitance in microfarads
inductance in microhenries
resistance in ohms

▭	Front panel marking
▭ (dashed)	Rear panel marking
*	Optimum value selected at factory
⊘	Screwdriver adjustment
P/O	Part of
———	Primary signal path
– – – –	Feedback path
9·7·5 ———	Insulated wire, white, violet, green
—— 4·5 ——	Insulated wire, yellow, green
Center conductor / Screen	Screened lead
⏚	Chassis ground

ASSEMBLY AND COMPONENT REFERENCING

The pulse generator consists of seven assemblies (A1 to A7) mounted in a frame. Components mounted on the assemblies are prefixed by the appropriate assembly number, thus A2CR2 is diode 2 mounted on A2. Components mounted directly on the frame have no prefix number.

Waveform test point (with number)	
Voltage test point	
Avalanche (zener) diode	
Color Code	0 – Black 1 – Brown 2 – Red 3 – Orange 4 – Yellow 5 – Green 6 – Blue 7 – Violet 8 – Gray 9 – White



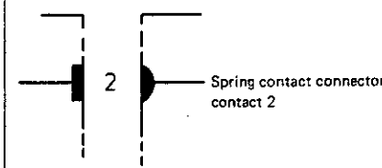


DIAGRAM 1
SHT 1 OF 4

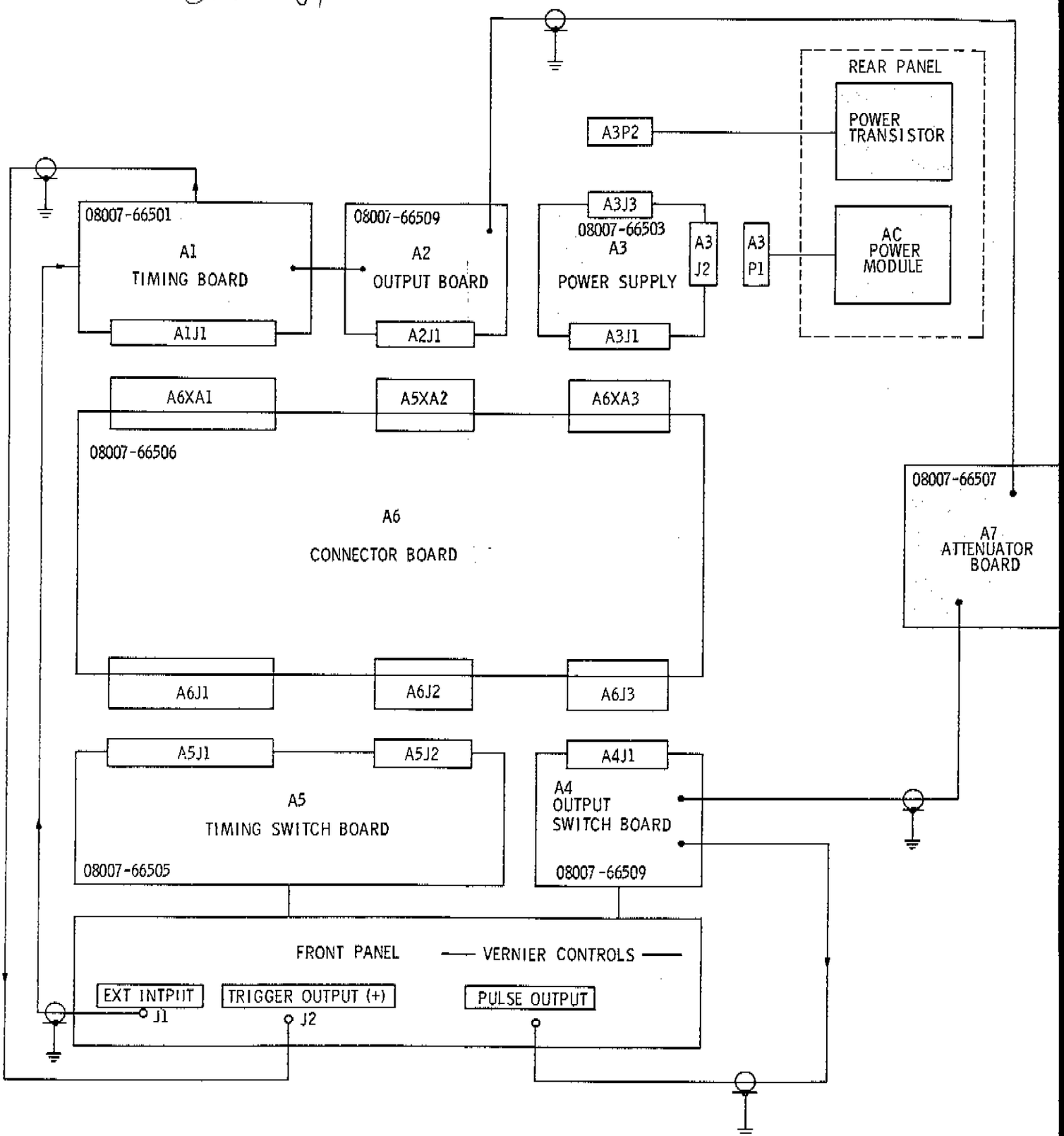
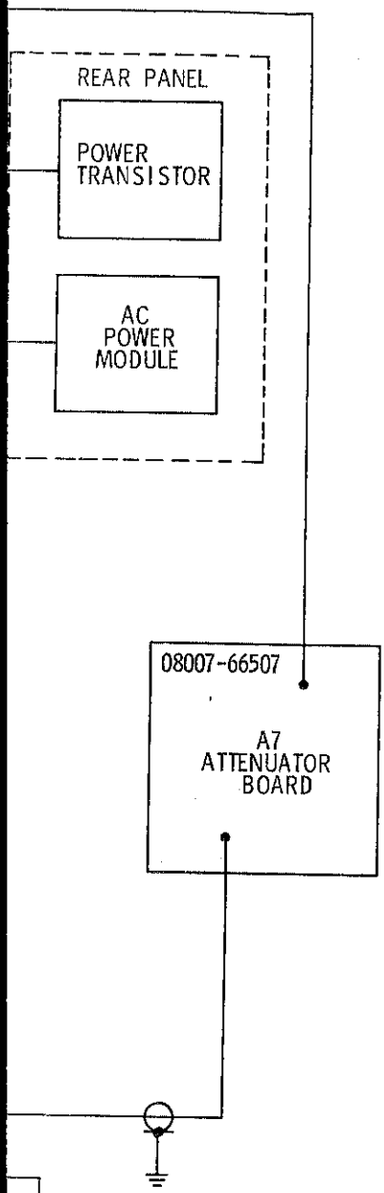


DIAGRAM 1
Sht 2 of 4



REFERENCE DESIGNATOR	HP PART NUMBER	DESCRIPTION	CIRCUIT DIAGRAM SHEET NUMBER	CIRCUIT DIAGRAM GRID REFERENCE	COMPONENT LAYOUT
A1	08007-66501	BD TIMG			
A2	08007-66508	BD AY OUTP AMPL			
A3	08007-66503	BD PWR SPLY			
A4	08007-66509	BD AY SW OUTPUT			
A5	08007-66505	BD SW TIMG			
A6	08007-66506	BD CONN			
A7	08007-63402	ATT AY			
F1	2110-0007	FUSE 1 FER			
F2	2110-0202	FUSE .5 FER			
MP1	2200-0103	SCR-MCH 4-40			
MP2	0520-0127	SCR-MCH 2-56			
MP4	2190-0014	WASH-LOCK INT 2			
MP5	2360-0207	SCR-MCH 6-32			
MP6	2190-0006	WASH-LOCK H-S 6			
MP7	0380-0008	SPACER BRS .5			
MP9	2360-0115	SCR-MCH 6-32			
MP10	2360-0203	SCR-MCH 6-32			
MP11	2190-0006	SAME AS MP 6			
MP12	2190-0017	WASH-LOCK HEL 8			
MP13	2510-0067	SCR-MCH 8-32 X2			
MP14	2580-0004	NUT-HEX 8-32.344			
MP15	3050-0071	WASH BRS .172ID			
MP16	3050-0387	WASH FIBR .169ID			
MP17	2360-0121	SCR-MCH 6-32 X.5			
MP18	08007-21101	HEATSINK			
MP19	2360-0125	SCR-MCH 6-32			
MP22	2360-0198	SCR-MCH 6-32			
MP23	08007-04102	CVR HEATSINK			
MP24	0370-2048	KNOB			
MP24	08007-04104	CVR AY TOP			
MP25	08006-04105	CVR AY BOT			
MP27	0370-1005	KNOB			
MP28	5060-8740	KIT RACKMONT			
Q2	1854-0072	XSTR 2N3054 SI			
Q6	1854-0072	SAME AS Q 2			
Q10	1854-0072	SAME AS Q 2			
Q14	1854-0072	SAME AS Q 2			
R1	0758-0049	R-F 33K5% .25W F			
R501	2100-2590	R-VAR 10K .25W			
R502	2100-3081	R-VAR 50K.25W CC			
R503	2100-2590	SAME AS R 501			
R504	2100-2290	R-VAR 500 .5W			
R505	0698-4292	R-F 39K5% .125W			
R655	2100-3081	SAME AS R 502			
R657	2100-3081	SAME AS R 502			
R818	2100-2635	R-VAR 50K .5W			
S7	3101-0124	SW-P-BTN SPST			
S13	3101-1244	SW P-BTN SPDT			
T1	5080-0947	XFMR			
W1	08007-61601	CBL AY SHIL			
W2	08007-61602	CBL AY SHILPWR			
W3	08007-61603	CBL COAXSET OF 3			

DIAGRAM 1
Sht 3 of 4

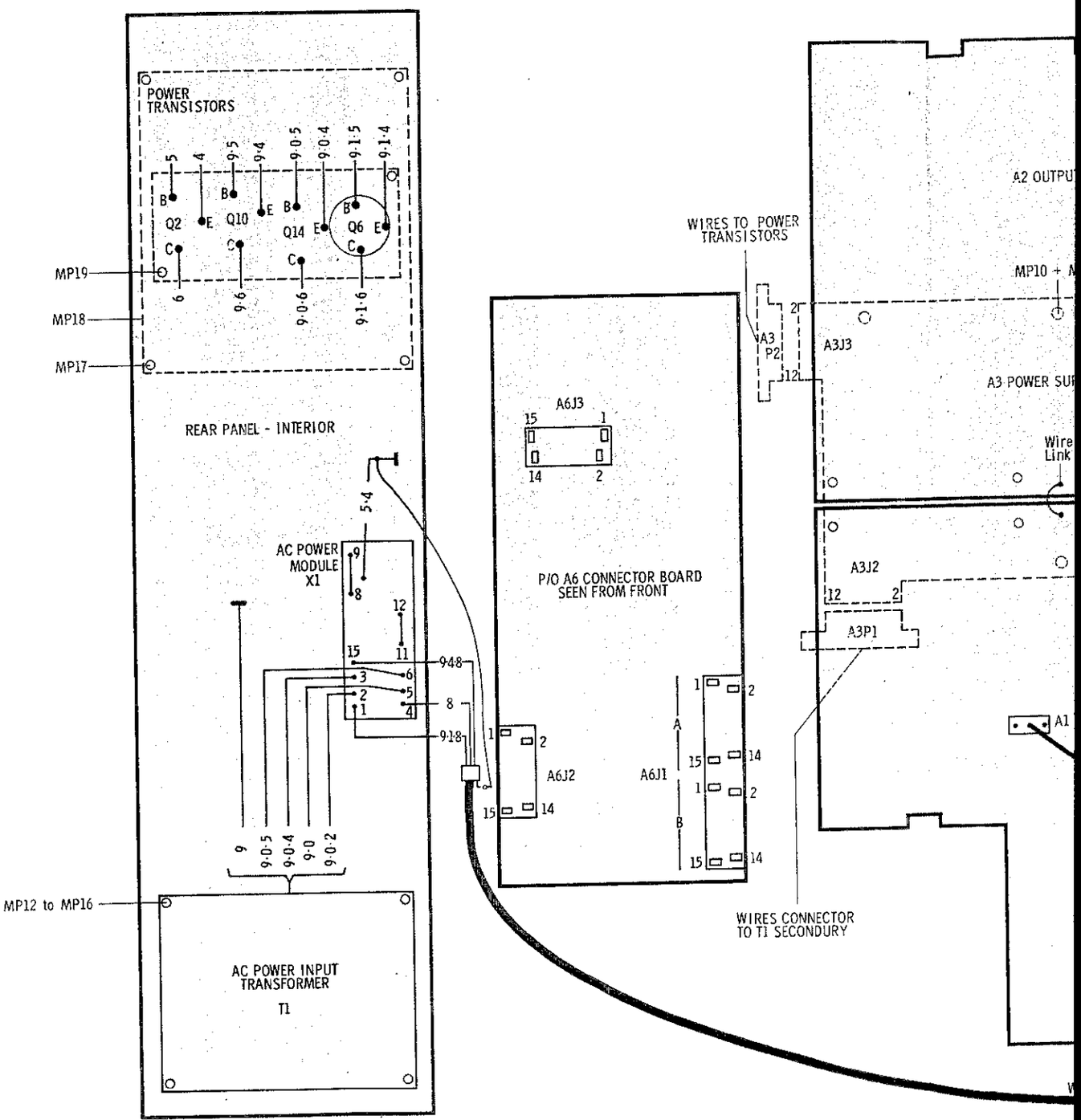


DIAGRAM 1
Sht 4 of 4

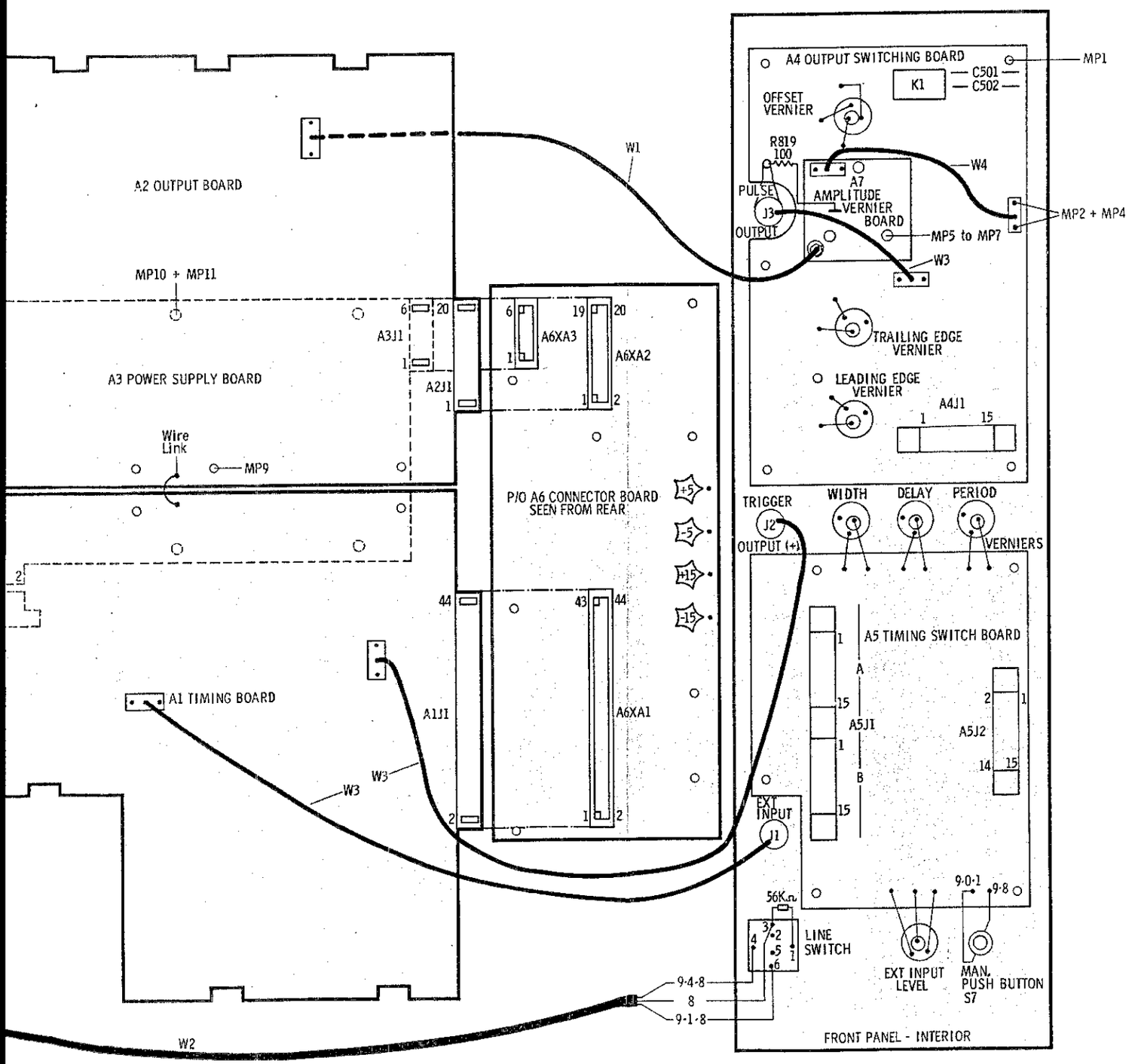


DIAGRAM 2 (1)
SHT 1 OF 7

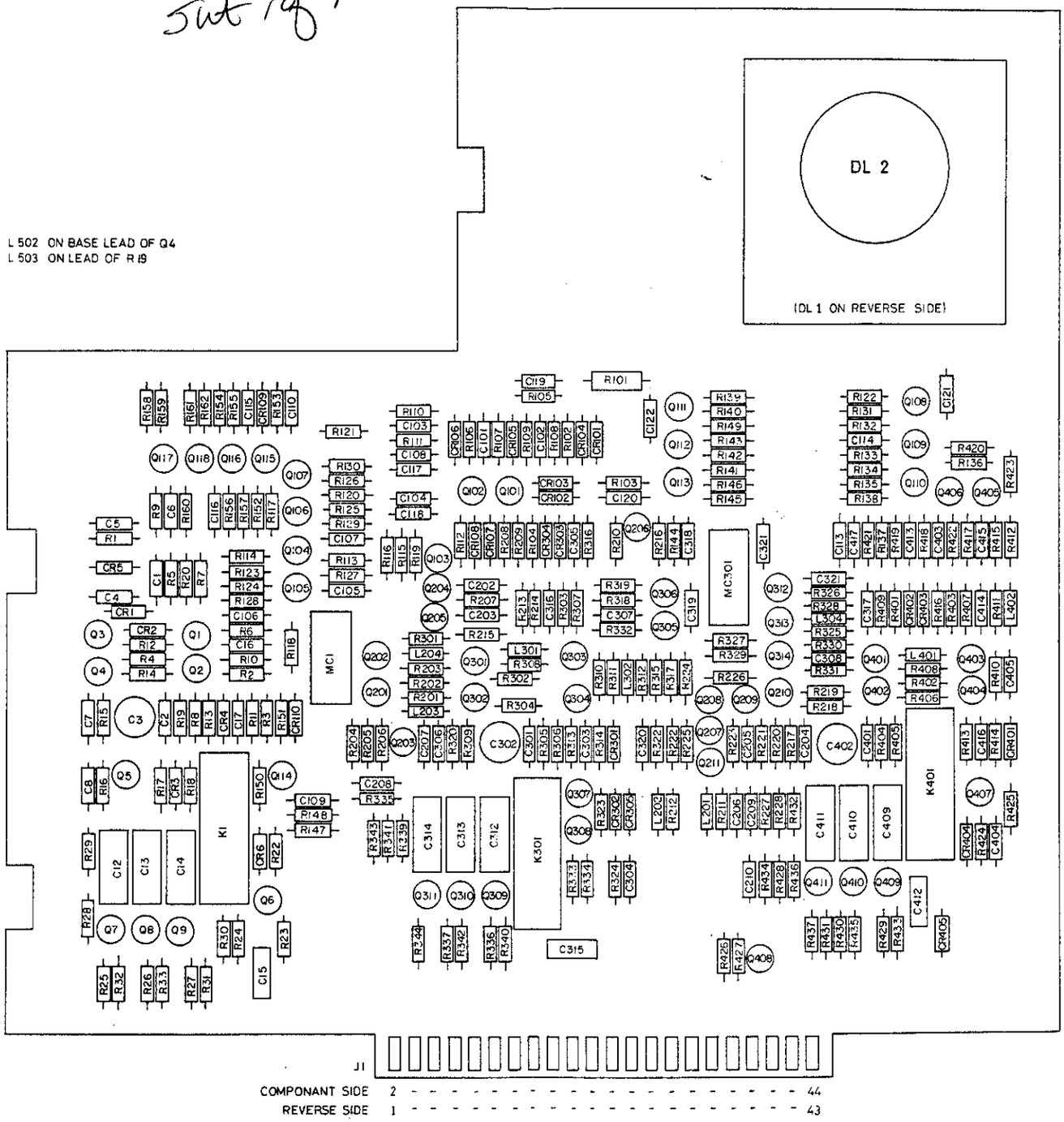


DIAGRAM 2 (1)
Sht 2 of 7

REFERENCE DESIGNATOR		H-P PART NUMBER	DESCRIPTION	CIRCUIT DIAGRAM SHEET NUMBER	CIRCUIT DIAGRAM GRID REFERENCE	COMPONENT LAYOUT
A1	C1	0160-2252	C-F 6.2PF 500V			
A1	C2	0160-2250	C-F 5.1PF 500V			
A1	C3	0121-0060	C-VAR 2-8PF			
A1	C4	0150-0084	C-F .1UF 100V			
A1	C5	0150-0084	C-F .1UF 100V			
A1	C6	0150-0084	C-F .1UF 100V			
A1	C7	0150-0084	C-F .1UF 100V			
A1	C8	0150-0084	C-F .1UF 100V			
A1	C12	0180-0228	C-F 22UF 15V			
A1	C13	0160-3725	C-F 0.68UF			
A1	C14	0160-3716	C-F .022UF10%250			
A1	C15	0160-2210	C-F 470PF 300V			
A1	C16	0150-0084	C-F .1UF 100V			
A1	C17	0150-0084	C-F .1UF 100V			
A1	C101	0150-0084	C-F .1UF 100V			
A1	C102	0150-0084	C-F .1UF 100V			
A1	C103	0150-0084	C-F .1UF 100V			
A1	C104	0150-0084	C-F .1UF 100V			
A1	C105	0150-0084	C-F .1UF 100V			
A1	C106	0150-0084	C-F .1UF 100V			
A1	C107	0150-0084	C-F .1UF 100V			
A1	C108	0150-0084	C-F .1UF 100V			
A1	C109	0160-2146	C-F .02UF 100V			
A1	C110	0150-0084	C-F .1UF 100V			
A1	C113	0150-0084	C-F .1UF 100V			
A1	C114	0150-0084	C-F .1UF 100V			
A1	C115	0150-0084	C-F .1UF 100V			
A1	C116	0150-0084	C-F .1UF 100V			
A1	C117	0150-0084	C-F .1UF 100V			
A1	C118	0150-0084	C-F .1UF 100V			
A1	C119	0150-0084	C-F .1UF 100V			
A1	C120	0150-0084	C-F .1UF 100V			
A1	C121	0160-2139	C-F 220PF 1KV			
A1	C122	0160-2139	C-F 220PF 1KV			
A1	C202	0150-0084	C-F .1UF 100V			
A1	C203	0150-0084	C-F .1UF 100V			
A1	C204	0150-0084	C-F .1UF 100V			
A1	C205	0150-0084	C-F .1UF 100V			
A1	C206	0160-2204	C-F 100PF 300V			
A1	C207	0150-0084	C-F .1UF 100V			
A1	C208	0150-0084	C-F .1UF 100V			
A1	C209	0150-0084	C-F .1UF 100V			
A1	C210	0150-0084	C-F .1UF 100V			
A1	C301	0160-2243	C-F 2.7PF 500V			
A1	C302	0121-0060	C-VAR 2-8PF			
A1	C303	0150-0084	C-F .1UF 100V			
A1	C304	0150-0084	C-F .1UF 100V			
A1	C305	0150-0084	C-F .1UF 100V			
A1	C306	0150-0084	C-F .1UF 100V			
A1	C307	0150-0084	C-F .1UF 100V			
A1	C308	0150-0084	C-F .1UF 100V			
A1	C312	0180-0228	C-F 22UF 15V			
A1	C313	0160-3725	C-F 0.68UF			
A1	C314	0160-3716	C-F .022UF10%250			
A1	C315	0160-2211	C-F 510PF 5%300V			
A1	C316	0150-0084	C-F .1UF 100V			
A1	C317	0150-0084	C-F .1UF 100V			
A1	C318	0150-0084	C-F .1UF 100V			
A1	C319	0150-0084	C-F .1UF 100V			
A1	C320	0150-0084	C-F .1UF 100V			
A1	C321	0150-0084	C-F .1UF 100V			
A1	C402	0121-0060	C-VAR 2-8PF			
A1	C403	0150-0084	C-F .1UF 100V			
A1	C404	0150-0084	C-F .1UF 100V			
A1	C405	0150-0084	C-F .1UF 100V			
A1	C409	0180-0228	C-F 22UF 15V			
A1	C410	0160-3725	C-F 0.68UF			
A1	C411	0160-3716	C-F .022UF10%250			
A1	C412	0160-2211	C-F 510PF 5%300V			
A1	C413	0150-0084	C-F .1UF 100V			
A1	C414	0150-0084	C-F .1UF 100V			
A1	C415	0150-0084	C-F .1UF 100V			
A1	C416	0150-0084	C-F .1UF 100V			
A1	C417	0150-0084	C-F .1UF 100V			
A1	CR1	1902-3092	DIO BKDN 4.99 V			
A1	CR2	1901-0040	DIO SI 30V .03A			
A1	CR3	1901-0040	DIO SI 30V .03A			
A1	CR4	1902-3036	DIO BKDN 3.16 V			
A1	CR5	1902-3059	DIO BKDN 4.83 V			
A1	CR6	1901-0040	DIO SI 30V .03A			
A1	CR101	1901-0179	DIO SI 15V .75NS			
A1	CR102	1901-0179	DIO SI 15V .75NS			
A1	CR103	1901-0179	DIO SI 15V .75NS			
A1	CR104	1901-0179	DIO SI 15V .75NS			
A1	CR105	1901-0179	DIO SI 15V .75NS			
A1	CR106	1901-0179	DIO SI 15V .75NS			
A1	CR107	1901-0179	DIO SI 15V .75NS			
A1	CR108	1901-0179	DIO SI 15V .75NS			
A1	CR109	1902-3036	DIO BKDN 3.16 V			
A1	CR110	1901-0179	DIO SI 15V .75NS			
A1	CR301	1902-0049	DIO BKDN 6.19 V			

REFERENCE DESIGNATOR		H-P PART NUMBER	DESCRIPTION	CIRCUIT DIAGRAM SHEET NUMBER	CIRCUIT DIAGRAM GRID REFERENCE	COMPONENT LAYOUT
A1	CR302	1901-0040	DIO SI 30V .03A			
A1	CR303	1901-0040	DIO SI 30V .03A			
A1	CR304	1901-0040	DIO SI 30V .03A			
A1	CR305	1901-0040	DIO SI 30V .03A			
A1	CR401	1902-0049	DIO BKDN 6.19 V			
A1	CR402	1901-0040	DIO SI 30V .03A			
A1	CR403	1901-0040	DIO SI 30V .03A			
A1	CR404	1901-0040	DIO SI 30V .03A			
A1	CR405	1901-0040	DIO SI 30V .03A			
A1	K1	0490-0732	RELAY-REED SPST			
A1	K301	0490-0732	RELAY-REED SPST			
A1	K401	0490-0732	RELAY-REED SPST			
A1	L201	9100-2247	COIL-CHOKE .10UH			
A1	L202	9100-2247	COIL-CHOKE .10UH			
A1	L203	9100-2247	COIL-CHOKE .10UH			
A1	L204	9100-2247	COIL-CHOKE .10UH			
A1	L301	9100-2247	COIL-CHOKE .10UH			
A1	L302	9100-2249	COIL-CHOKE .15UH			
A1	L303	9100-2247	COIL-CHOKE .10UH			
A1	L304	9100-2247	COIL-CHOKE .10UH			
A1	L401	9100-2247	COIL-CHOKE .10UH			
A1	L402	9100-2249	COIL-CHOKE .15UH			
A1	L502	9170-0029	CORE FERRI BEAD			
A1	L503	9170-0029	CORE FERRI BEAD			
A1	MC1	1820-0285	IC 250MHZ 16PIN			
A1	MC301	1820-0285	IC 250MHZ 16PIN			
A1	Q1	1854-0345	XSTR 2N5179 SI			
A1	Q2	1854-0305	XSTR SI NPN			
A1	Q3	1854-0345	XSTR 2N5179 SI			
A1	Q4	1853-0203	XSTR SI PNP			
A1	Q5	1853-0203	XSTR SI PNP			
A1	Q6	1853-0090	XSTR SI PNP			
A1	Q7	1853-0203	XSTR SI PNP			
A1	Q8	1853-0203	XSTR SI PNP			
A1	Q9	1853-0203	XSTR SI PNP			
A1	Q101	1854-0305	XSTR SI NPN			
A1	Q102	1854-0305	XSTR SI NPN			
A1	Q103	1853-0203	XSTR SI PNP			
A1	Q104	1854-0345	XSTR 2N5179 SI			
A1	Q105	1854-0345	XSTR 2N5179 SI			
A1	Q106	1854-0345	XSTR 2N5179 SI			
A1	Q107	1854-0345	XSTR 2N5179 SI			
A1	Q108	1853-0203	XSTR SI PNP			
A1	Q109	1853-0203	XSTR SI PNP			
A1	Q110	1854-0345	XSTR 2N5179 SI			
A1	Q111	1853-0203	XSTR SI PNP			
A1	Q112	1853-0203	XSTR SI PNP			
A1	Q113	1854-0345	XSTR 2N5179 SI			
A1	Q114	1854-0307	XSTR SI NPN			
A1	Q115	1854-0345	XSTR 2N5179 SI			
A1	Q116	1854-0345	XSTR 2N5179 SI			
A1	Q117	1853-0203	XSTR SI PNP			
A1	Q118	1853-0203	XSTR SI PNP			
A1	Q201	1854-0345	XSTR 2N5179 SI			
A1	Q202	1854-0345	XSTR 2N5179 SI			
A1	Q203	1853-0203	XSTR SI PNP			
A1	Q204	1853-0203	XSTR SI PNP			
A1	Q205	1853-0018	XSTR SI PNP			
A1	Q206	1853-0203	XSTR SI PNP			
A1	Q207	1854-0345	XSTR 2N5179 SI			
A1	Q208	1854-0345	XSTR 2N5179 SI			
A1	Q209	1853-0203	XSTR SI PNP			
A1	Q210	1853-0018	XSTR SI PNP			
A1	Q211	1853-0203	XSTR SI PNP			
A1	Q301	1854-0345	XSTR 2N5179 SI			
A1	Q302	1854-0305	XSTR SI NPN			
A1	Q303	1853-0203	XSTR SI PNP			
A1	Q304	1853-0203	XSTR SI PNP			
A1	Q305	1854-0345	XSTR 2N5179 SI			
A1	Q306	1854-0345	XSTR 2N5179 SI			
A1	Q307	1853-0203	XSTR SI PNP			
A1	Q308	1853-0090	XSTR SI PNP			
A1	Q309	1853-0203	XSTR SI PNP			
A1	Q310	1853-0203	XSTR SI PNP			
A1	Q311	1853-0203	XSTR SI PNP			
A1	Q312	1854-0345	XSTR 2N5179 SI			
A1	Q313	1854-0345	XSTR 2N5179 SI			
A1	Q314	1853-0018	XSTR SI PNP			
A1	Q401	1854-0345	XSTR 2N5179 SI			
A1	Q402	1854-0305	XSTR SI NPN			
A1	Q403	1853-0203	XSTR SI PNP			
A1	Q404	1853-0203	XSTR SI PNP			
A1	Q405	1854-0345	XSTR 2N5179 SI			
A1	Q406	1854-0345	XSTR 2N5179 SI			
A1	Q407	1853-0203	XSTR SI PNP			
A1	Q408	1853-0090	XSTR SI PNP			
A1	Q409	1853-0203	XSTR SI PNP			
A1	Q410	1853-0203	XSTR SI PNP			
A1	Q411	1853-0203	XSTR SI PNP			

DIAGRAM 2 (1)
SHT 3 of 7

REFERENCE DESIGNATOR		H-P PART NUMBER	DESCRIPTION	CIRCUIT DIAGRAM SHEET NUMBER	CIRCUIT DIAGRAM GRID REFERENCE	COMPONENT LAYOUT
A1	R1	0698-3132	R-F 261 1% .125W			
A1	R2	0758-0086	R-F 100 5% .125W			
A1	R3	0698-4264	R-F 2.7K5% .125W			
A1	R4	0698-3800	R-F 24 5% .125W			
A1	R5	0698-4226	R-F 62 5% .125W			
A1	R7	0698-3800	R-F 24 5% .125W			
A1	R8	0698-3800	R-F 24 5% .125W			
A1	R9	0698-4252	R-F 820 5% .125W			
A1	R10	0698-4237	R-F 180 5% .125W			
A1	R11	0698-4237	R-F 180 5% .125W			
A1	R12	0698-4225	R-F 56 5% .125W			
A1	R13	0698-4278	R-F 10K5% .125W			
A1	R14	0698-6802	R-F 10 5% .125W			
A1	R15	0698-4231	R-F 91 5% .125W			
A1	R16	0698-4239	R-F 220 5% .125W			
A1	R17	0698-3800	R-F 24 5% .125W			
A1	R18	0698-4261	R-F 2K5% .125W F			
A1	R19	0698-6802	R-F 10 5% .125W			
A1	R20	0698-4247	R-F 510 5% .125W			
A1	R22	0698-4280	R-F 12K5% .125W			
A1	R23	0698-6802	R-F 10 5% .125W			
A1	R24	0683-1055	R-F 1M5% .25W CC			
A1	R25	0698-4258	R-F 1.5K5% .125W			
A1	R26	0698-4258	R-F 1.5K5% .125W			
A1	R27	0698-4258	R-F 1.5K5% .125W			
A1	R28	0683-1055	R-F 1M5% .25W CC			
A1	R29	0683-1055	R-F 1M5% .25W CC			
A1	R30	0683-1055	R-F 1M5% .25W CC			
A1	R31	0698-4239	R-F 220 5% .125W			
A1	R32	0698-4239	R-F 220 5% .125W			
A1	R33	0698-4239	R-F 220 5% .125W			
A1	R101	0758-0093	R-F 56 5% .25W F			
A1	R102	0698-0085	R-F 2.61K1%			
A1	R103	0698-0085	R-F 2.61K1%			
A1	R104	0698-4242	R-F 300 5% .125W			
A1	R105	0757-0915	R-F 430 2% .125W			
A1	R106	0698-6802	R-F 10 5% .125W			
A1	R107	0698-4246	R-F 470 5% .125W			
A1	R108	0698-4278	R-F 10K5% .125W			
A1	R109	0698-6746	R-F 43 5% .125W			
A1	R110	0698-6746	R-F 43 5% .125W			
A1	R111	0698-4278	R-F 10K5% .125W			
A1	R112	0758-0086	R-F 100 5% .125W			
A1	R113	0758-0086	R-F 100 5% .125W			
A1	R114	0698-4232	R-F 110 5% .125W			
A1	R115	0698-4245	R-F 390 5% .125W			
A1	R116	0698-4245	R-F 390 5% .125W			
A1	R117	0698-6802	R-F 10 5% .125W			
A1	R118	0698-6802	R-F 10 5% .125W			
A1	R119	0698-6744	R-F 20 5% .125W			
A1	R120	0698-6802	R-F 10 5% .125W			
A1	R121	0698-6802	R-F 10 5% .125W			
A1	R122	0698-6802	R-F 10 5% .125W			
A1	R123	0698-4233	R-F 120 5% .125W			
A1	R124	0698-4233	R-F 120 5% .125W			
A1	R125	0698-4233	R-F 120 5% .125W			
A1	R126	0698-4233	R-F 120 5% .125W			
A1	R127	0698-4233	R-F 120 5% .125W			
A1	R128	0698-4233	R-F 120 5% .125W			
A1	R129	0698-4233	R-F 120 5% .125W			
A1	R130	0698-4233	R-F 120 5% .125W			
A1	R131	0698-4226	R-F 62 5% .125W			
A1	R132	0698-4240	R-F 240 5% .125W			
A1	R133	0683-4705	R-F 47 5% .25W			
A1	R134	0698-4249	R-F 620 5% .125W			
A1	R135	0698-4232	R-F 110 5% .125W			
A1	R136	0698-6802	R-F 10 5% .125W			
A1	R137	0698-4233	R-F 120 5% .125W			
A1	R138	0698-4233	R-F 120 5% .125W			
A1	R139	0698-4226	R-F 62 5% .125W			
A1	R140	0698-4240	R-F 240 5% .125W			
A1	R141	0698-4232	R-F 110 5% .125W			
A1	R142	0698-4249	R-F 620 5% .125W			
A1	R143	0683-4705	R-F 47 5% .25W			
A1	R144	0698-6802	R-F 10 5% .125W			
A1	R145	0698-4233	R-F 120 5% .125W			
A1	R146	0698-4233	R-F 120 5% .125W			
A1	R147	0698-4254	R-F 1K5% .125W F			
A1	R148	0698-4254	R-F 1K5% .125W F			
A1	R149	0698-6802	R-F 10 5% .125W			
A1	R150	0698-4235	R-F 150 5% .125W			
A1	R151	0698-4290	R-F 33K5% .125W			
A1	R152	0698-4226	R-F 62 5% .125W			
A1	R153	0698-4254	R-F 1K5% .125W F			
A1	R154	0698-4236	R-F 160 5% .125W			
A1	R155	0698-4227	R-F 68 5% .125W			
A1	R156	0698-4250	R-F 680 5% .125W			
A1	R157	0698-4236	R-F 160 5% .125W			
A1	R158	0698-3800	R-F 24 5% .125W			
A1	R159	0698-4250	R-F 680 5% .125W			
A1	R160	0698-6802	R-F 10 5% .125W			
A1	R161	0698-4234	R-F 130 5% .125W			

REFERENCE DESIGNATOR		H-P PART NUMBER	DESCRIPTION	CIRCUIT DIAGRAM SHEET NUMBER	CIRCUIT DIAGRAM GRID REFERENCE	COMPONENT LAYOUT
A1	R162	0698-4242	R-F 300 5% .125W			
A1	R201	0698-4226	R-F 62 5% .125W			
A1	R202	0698-4239	R-F 220 5% .125W			
A1	R203	0698-4226	R-F 62 5% .125W			
A1	R204	0698-4244	R-F 360 5% .125W			
A1	R205	0698-4236	R-F 160 5% .125W			
A1	R206	0698-4237	R-F 180 5% .125W			
A1	R207	0698-4237	R-F 180 5% .125W			
A1	R208	0698-4261	R-F 2K5% .125W F			
A1	R209	0758-0086	R-F 100 5% .125W			
A1	R210	0698-4256	R-F 1.2K5% .125W			
A1	R211	0698-6744	R-F 20 5% .125W			
A1	R212	0758-0124	R-F 51 5% .125W			
A1	R213	0698-4244	R-F 360 5% .125W			
A1	R214	0698-4236	R-F 160 5% .125W			
A1	R215	0698-6802	R-F 10 5% .125W			
A1	R216	0757-0915	R-F 430 2% .125W			
A1	R217	0698-4244	R-F 360 5% .125W			
A1	R218	0698-4236	R-F 160 5% .125W			
A1	R219	0698-6802	R-F 10 5% .125W			
A1	R220	0698-4261	R-F 2K5% .125W F			
A1	R221	0758-0086	R-F 100 5% .125W			
A1	R222	0698-4227	R-F 68 5% .125W			
A1	R223	0698-4240	R-F 240 5% .125W			
A1	R224	0698-4249	R-F 620 5% .125W			
A1	R225	0698-6802	R-F 10 5% .125W			
A1	R226	0698-4237	R-F 180 5% .125W			
A1	R227	0758-0086	R-F 100 5% .125W			
A1	R228	0698-4262	R-F 2.2K5% .125W			
A1	R301	0698-5705	R-F 39 5% .125W			
A1	R302	0698-6802	R-F 10 5% .125W			
A1	R303	0698-4243	R-F 330 5% .125W			
A1	R304	0698-3800	R-F 24 5% .125W			
A1	R305	0698-6744	R-F 20 5% .125W			
A1	R306	0698-6802	R-F 10 5% .125W			
A1	R307	0683-4705	R-F 47 5% .25W			
A1	R308	0698-4233	R-F 120 5% .125W			
A1	R309	0698-4240	R-F 240 5% .125W			
A1	R310	0698-3800	R-F 24 5% .125W			
A1	R311	0698-4226	R-F 62 5% .125W			
A1	R312	0698-4227	R-F 68 5% .125W			
A1	R313	0698-3800	R-F 24 5% .125W			
A1	R314	0698-4278	R-F 10K5% .125W			
A1	R315	0698-4225	R-F 56 5% .125W			
A1	R316	0698-4250	R-F 680 5% .125W			
A1	R317	0698-4244	R-F 360 5% .125W			
A1	R318	0698-4229	R-F 75 5% .125W			
A1	R319	0698-4247	R-F 510 5% .125W			
A1	R320	0698-4261	R-F 270 5% .125W			
A1	R322	0698-4242	R-F 300 5% .125W			
A1	R323	0698-3800	R-F 24 5% .125W			
A1	R324	0698-4237	R-F 180 5% .125W			
A1	R325	0698-4226	R-F 62 5% .125W			
A1	R326	0698-4226	R-F 62 5% .125W			
A1	R327	0698-4237	R-F 180 5% .125W			
A1	R328	0698-4239	R-F 220 5% .125W			
A1	R329	0698-4244	R-F 360 5% .125W			
A1	R330	0698-4236	R-F 160 5% .125W			
A1	R331	0698-6802	R-F 10 5% .125W			
A1	R332	0758-0124	R-F 51 5% .125W			
A1	R333	0698-4280	R-F 12K5% .125W			
A1	R334	0698-6802	R-F 10 5% .125W			
A1	R335	0683-1055	R-F 1M5% .25W CC			
A1	R336	0698-4258	R-F 1.5K5% .125W			
A1	R337	0698-4258	R-F 1.5K5% .125W			
A1	R338	0698-4258	R-F 1.5K5% .125W			
A1	R339	0683-1055	R-F 1M5% .25W CC			
A1	R340	0698-4239	R-F 220 5% .125W			
A1	R341	0683-1055	R-F 1M5% .25W CC			
A1	R342	0698-4239	R-F 220 5% .125W			
A1	R343	0683-1055	R-F 1M5% .25W CC			
A1	R344	0698-4239	R-F 220 5% .125W			
A1	R401	0698-5705	R-F 39 5% .125W			
A1	R402	0698-6802	R-F 10 5% .125W			
A1	R403	0698-4243	R-F 330 5% .125W			
A1	R404	0698-3800	R-F 24 5% .125W			
A1	R405	0698-6744	R-F 20 5% .125W			
A1	R406	0698-6802	R-F 10 5% .125W			
A1	R407	0683-4705	R-F 47 5% .25W			
A1	R408	0698-4233	R-F 120 5% .125W			
A1	R409	0698-4240	R-F 240 5% .125W			
A1	R410	0698-3800	R-F 24 5% .125W			
A1	R411	0698-4226	R-F 62 5% .125W			
A1	R412	0698-4227	R-F 68 5% .125W			
A1	R413	0698-3800	R-F 24 5% .125W			
A1	R414	0698-4278	R-F 10K5% .125W			
A1	R415	0698-4225	R-F 56 5% .125W			
A1	R416	0698-4250	R-F 680 5% .125W			
A1	R417	0698-4244	R-F 360 5% .125W			
A1	R418	0758-0086	R-F 100 5% .125W			
A1	R419	0698-4247	R-F 510 5% .125W			

DIAGRAM 2 (1)
Sht 4 of 7

REFERENCE DESIGNATOR		H-P PART NUMBER	DESCRIPTION	CIRCUIT DIAGRAM		COMPONENT LAYOUT
				SHEET NUMBER	GRID REFERENCE	
A1	R420	0758-0124	R-F 51 5% .125W			
A1	R421	0698-4241	R-F 270 5% .125W			
A1	R422	0698-4242	R-F 300 5% .125W			
A1	R423	0698-4227	R-F 68 5% .125W			
A1	R424	0698-4237	R-F 180 5% .125W			
A1	R425	0698-3800	R-F 24 5% .125W			
A1	R426	0698-4280	R-F 12K5% .125W			
A1	R427	0698-6802	R-F 10 5% .125W			
A1	R428	0683-1055	R-F 1M5% .25W CC			
A1	R429	0698-4258	R-F 1.5K5% .125W			
A1	R430	0698-4258	R-F 1.5K5% .125W			
A1	R431	0698-4258	R-F 1.5K5% .125W			
A1	R432	0683-1055	R-F 1M5% .25W CC			
A1	R433	0698-4239	R-F 220 5% .125W			
A1	R434	0683-1055	R-F 1M5% .25W CC			
A1	R435	0698-4239	R-F 220 5% .125W			
A1	R436	0683-1055	R-F 1M5% .25W CC			
A1	R437	0698-4239	R-F 220 5% .125W			
A1	R726	0757-0440	R-F 7.5K1% .125W			

*Test Set-Up for Waveforms Shown

HP 140A with 1410A and 1425A Plug-ins

Sweep: 50ns/cm
Sensitivity: 100mV/cm
Probe with 10:1 divider

8007B Settings

Pulse Period: < 170ns
Delay: minimum
Width: ~ 100ns
Mode: NORM
SYMM.NORM.COMPL.:NORM
Pulse Polarity: +

DIAGRAM 2 (1)
Sht 5 of 7

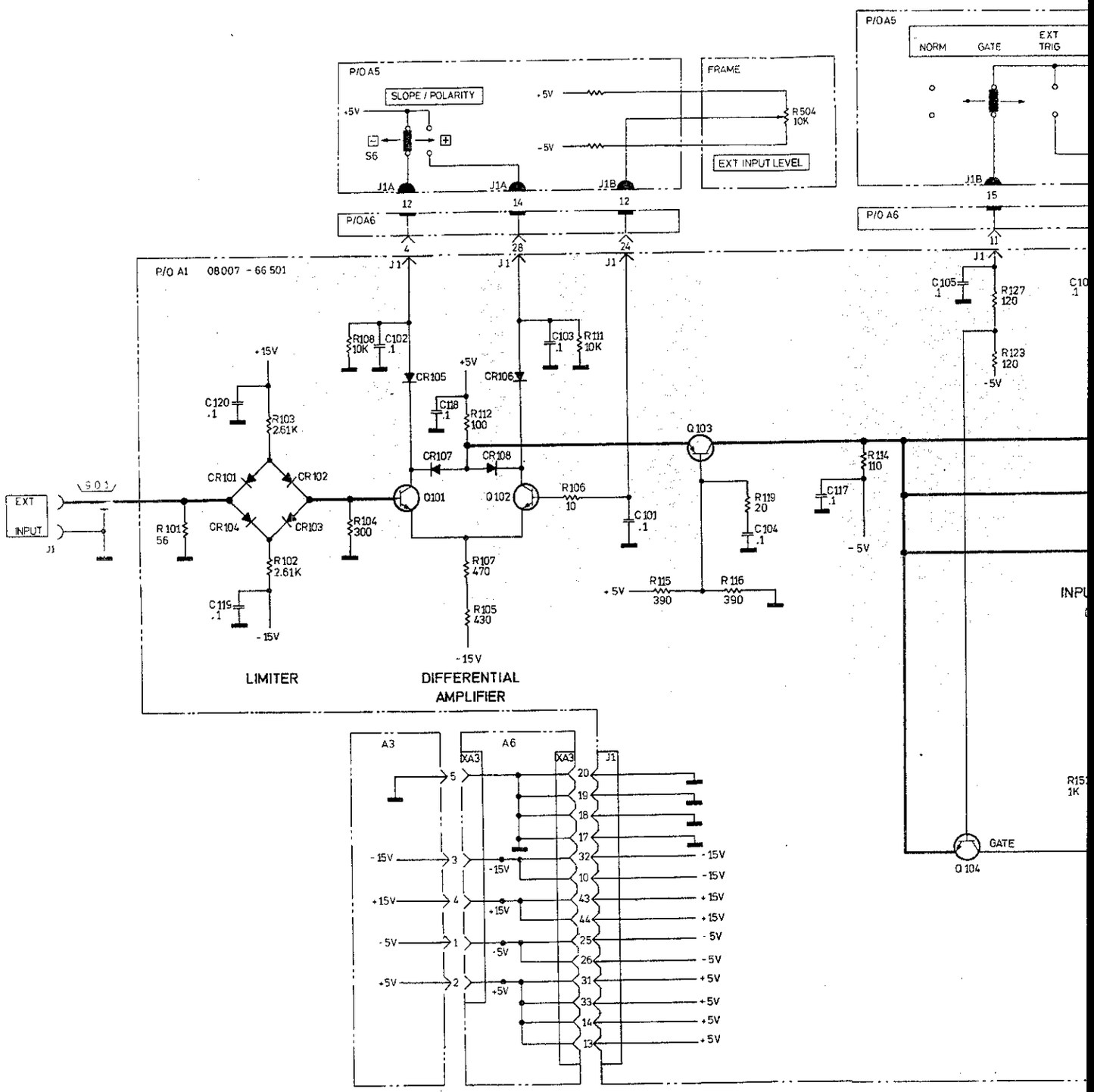


DIAGRAM 2 (1)
SN 6807

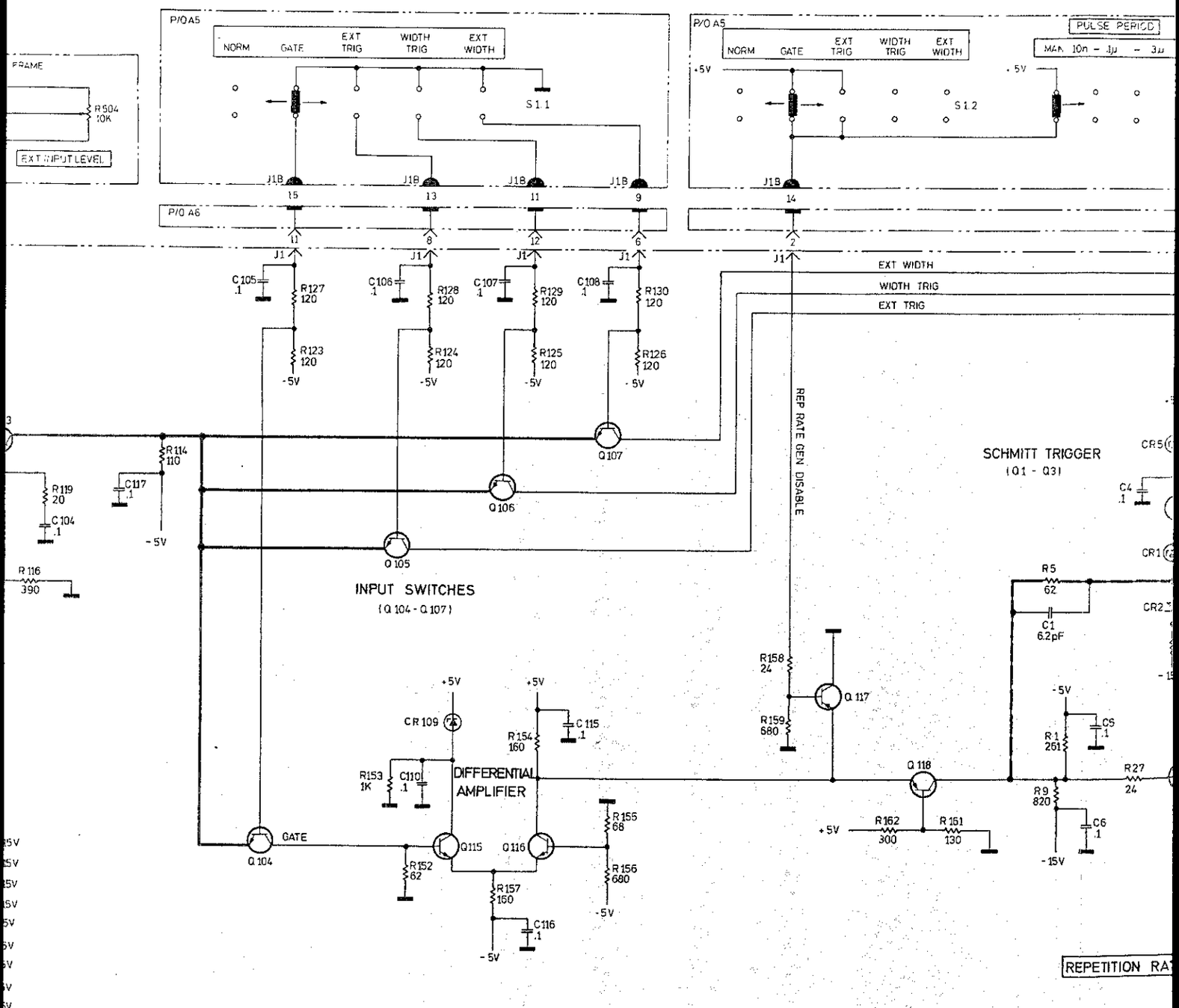


DIAGRAM 2 (1)
SHT 1 of 1

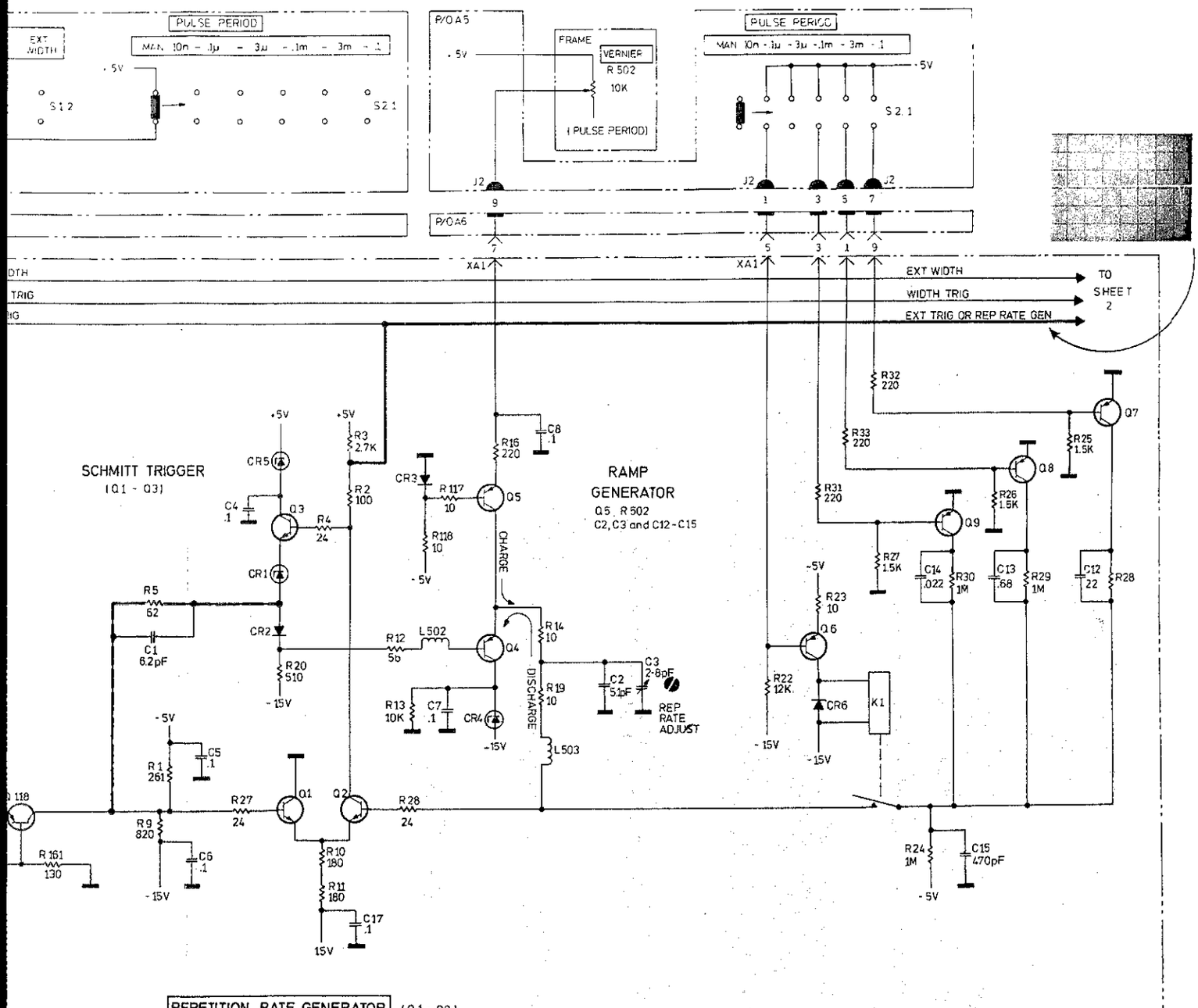


DIAGRAM 2 (2)
SHT 1 of 3

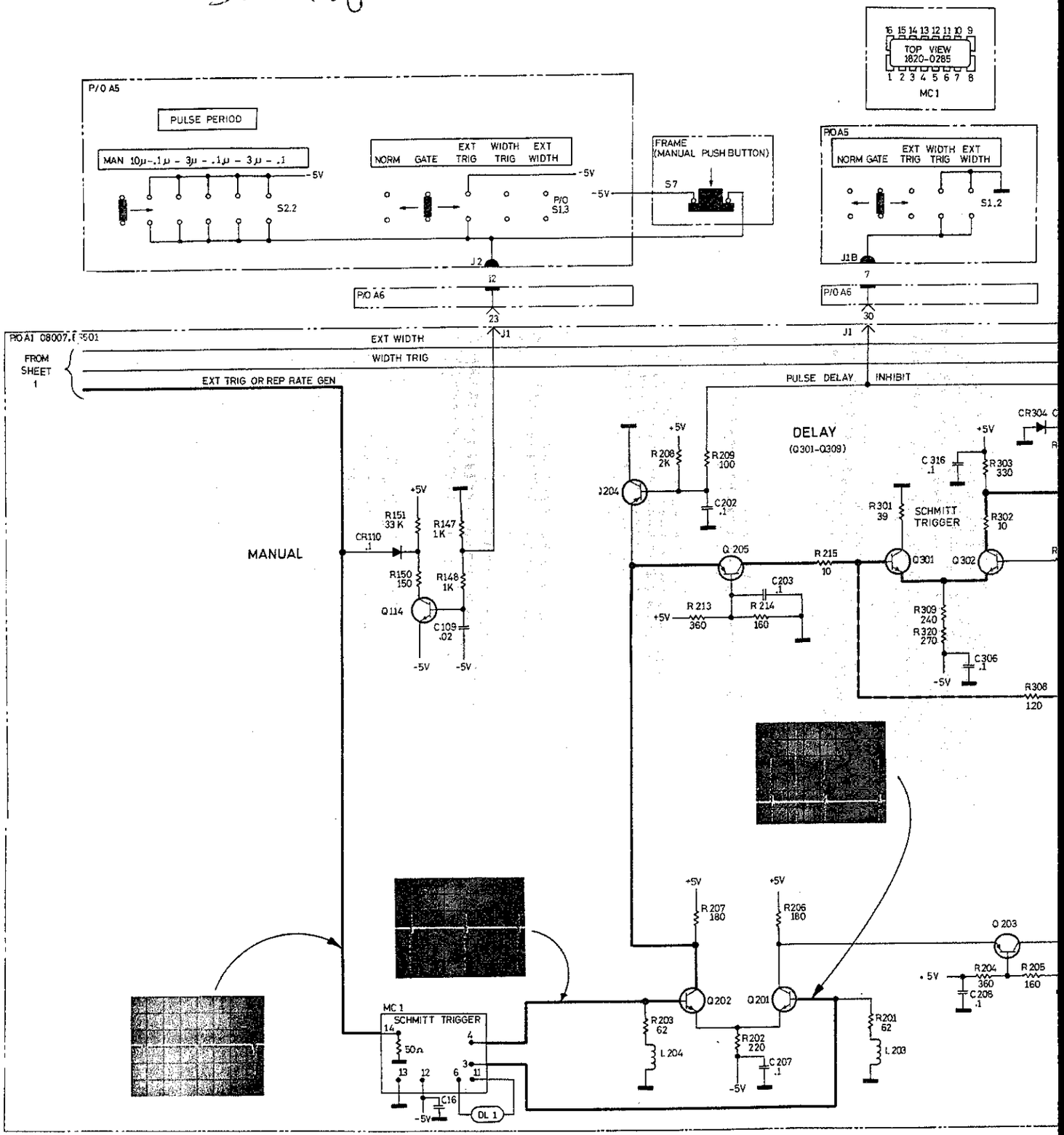


DIAGRAM 2 (2)
SHT 2 of 3

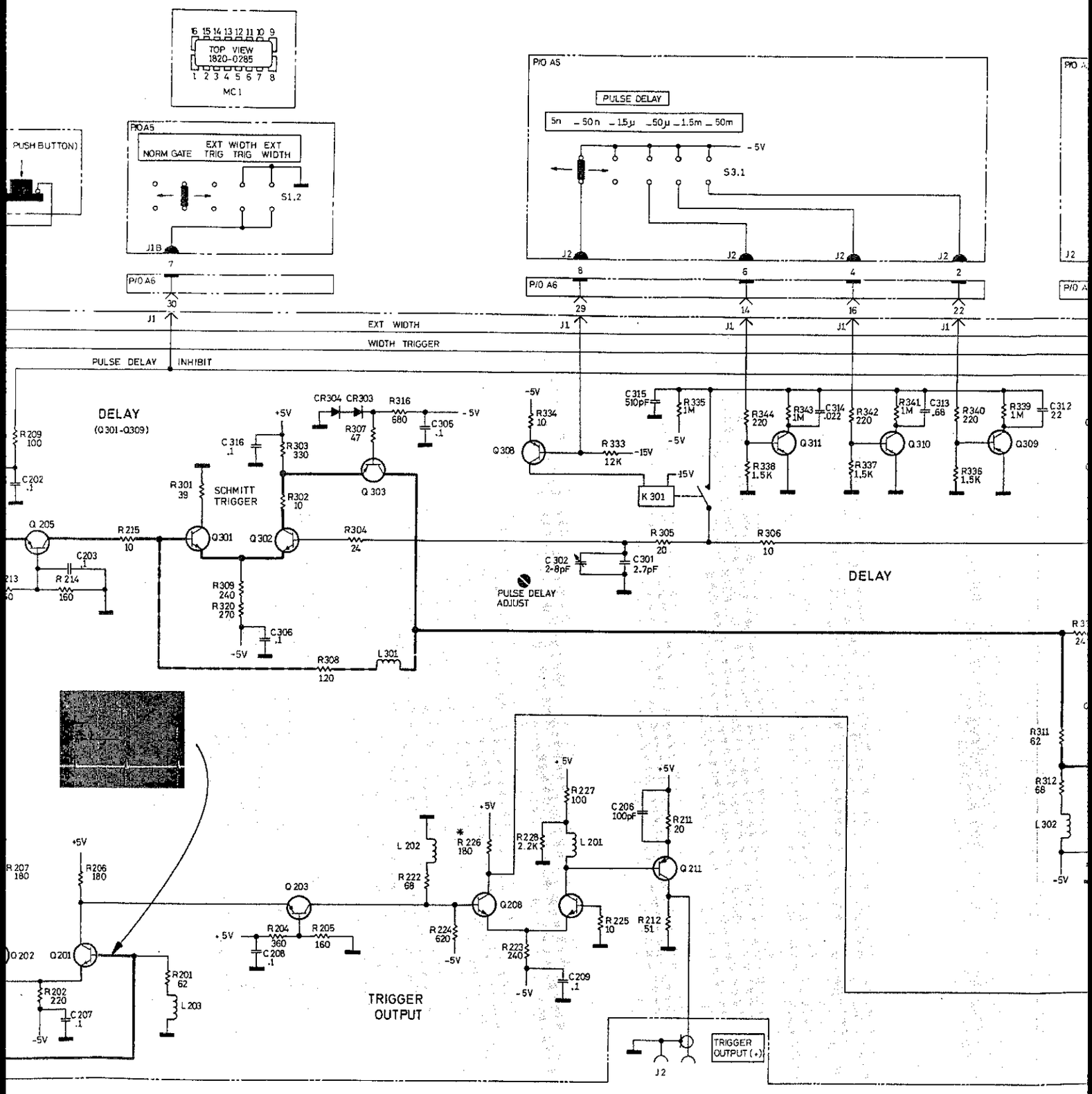


DIAGRAM 2 (2)
Sht 3 of 3

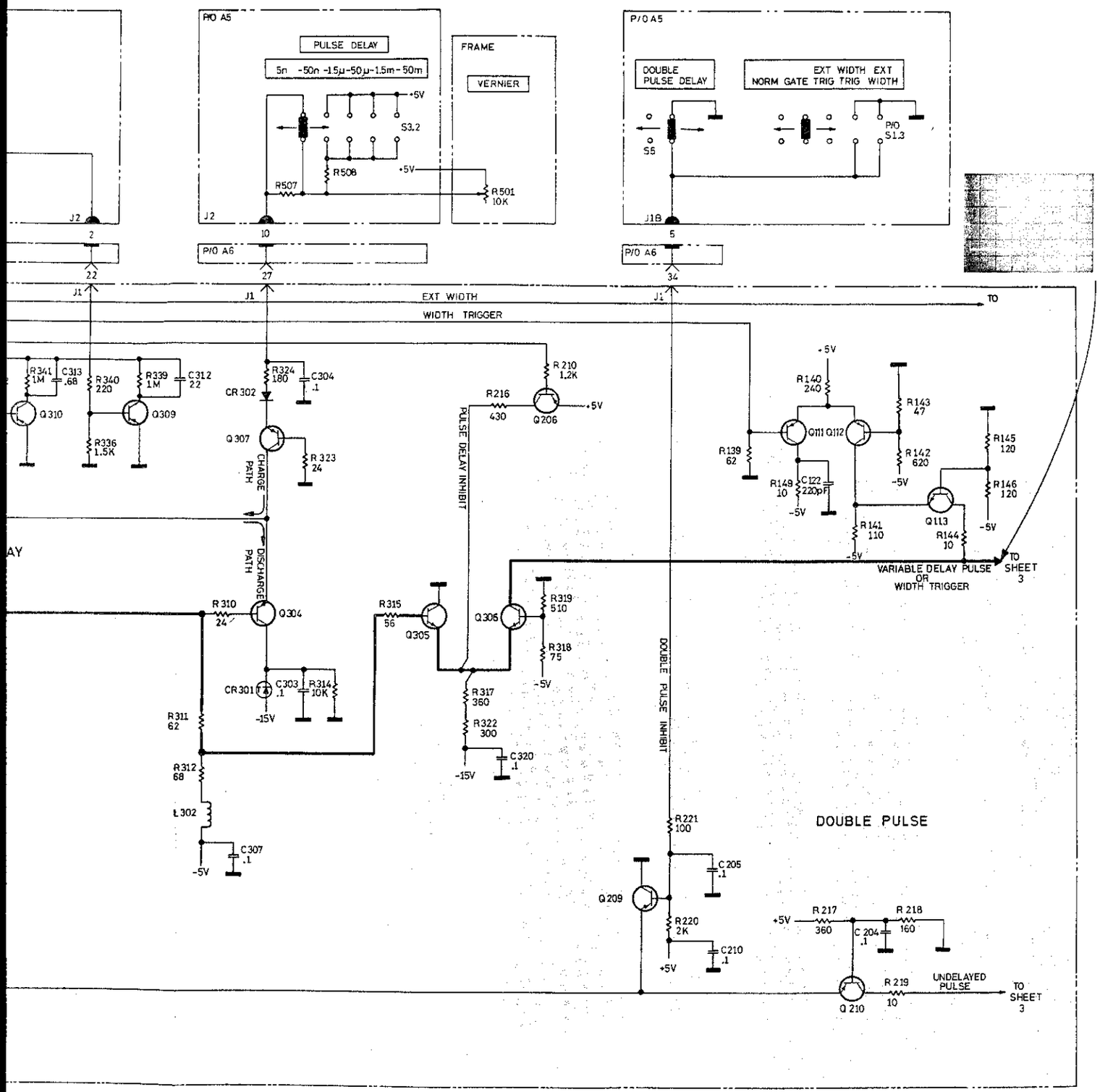


DIAGRAM 2 (3)
SHT 1 of 2

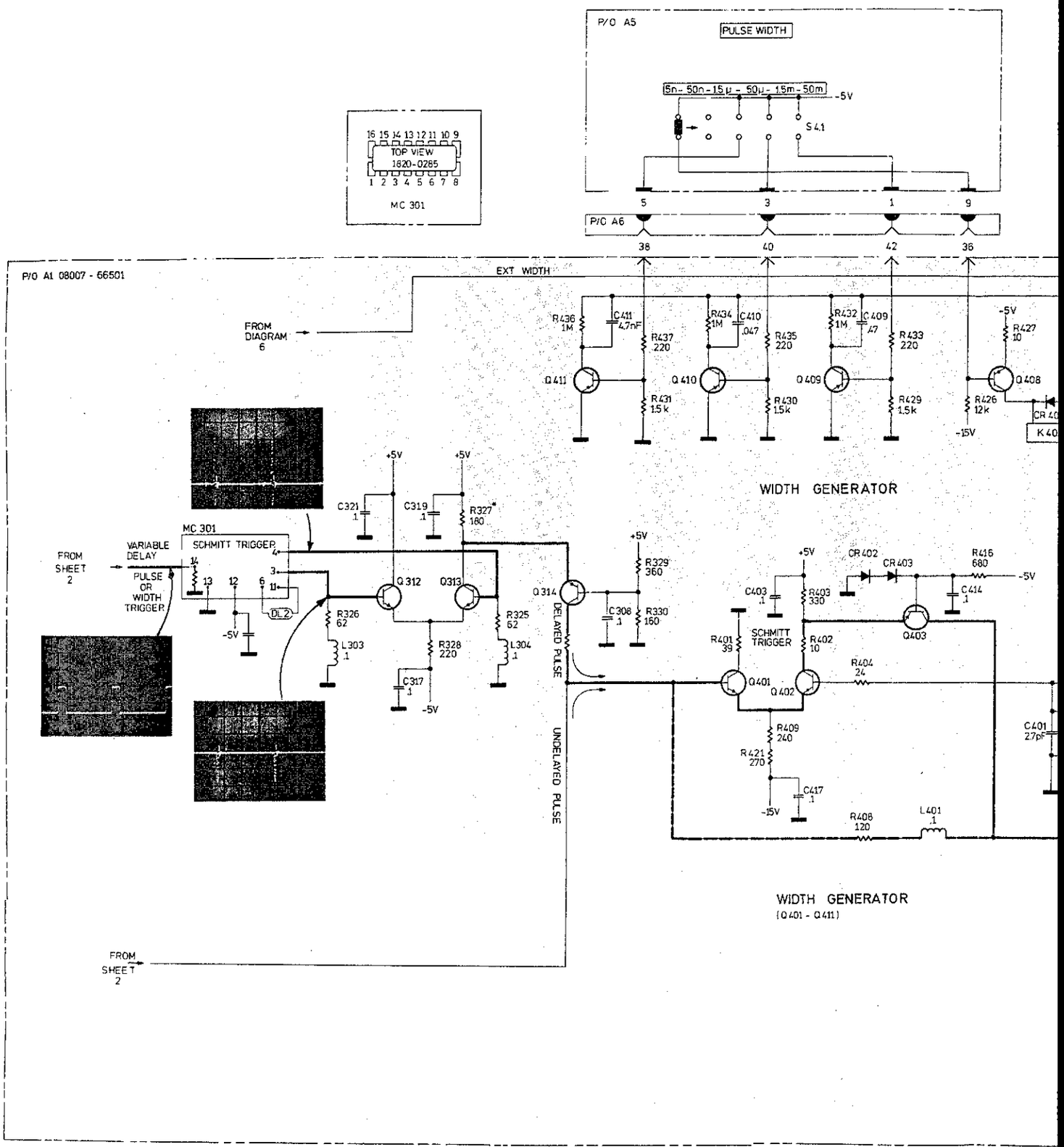


DIAGRAM 2 (3)
Sht 2 of 2

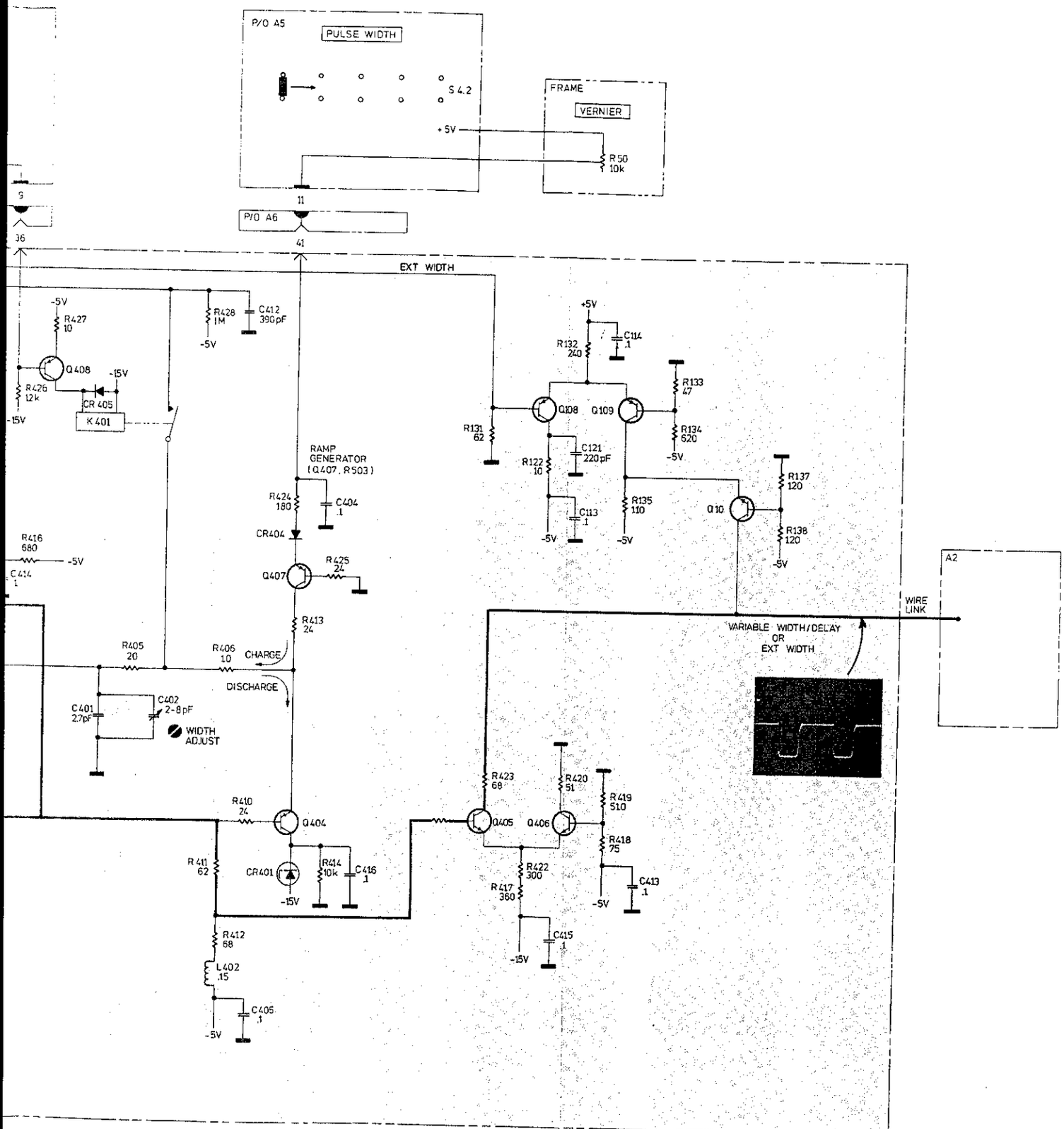


DIAGRAM 3 (1)
SAT 10 of 6

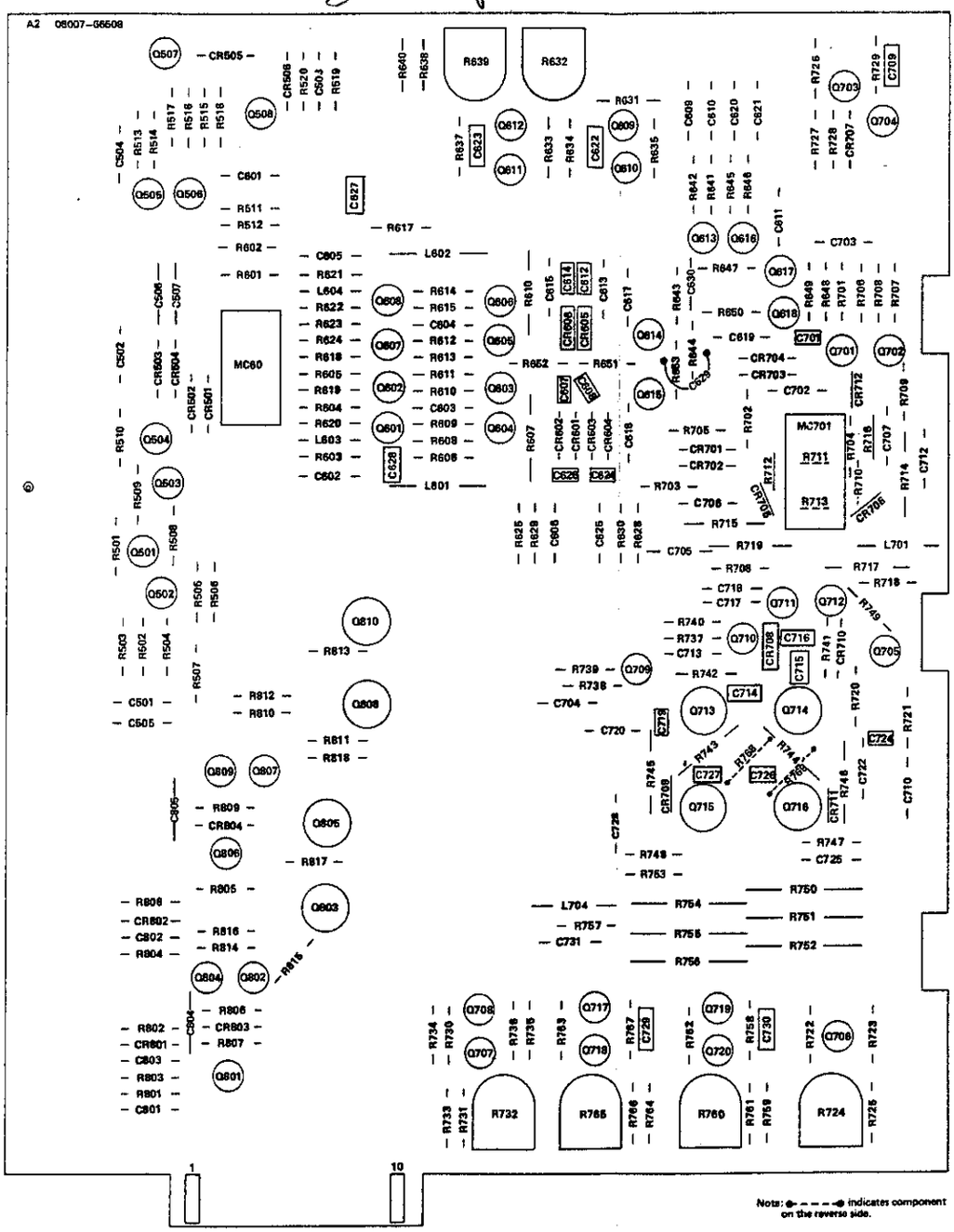


DIAGRAM 3 (1)
SHT 2 OF 6

REFERENCE DESIGNATOR		H-P PART NUMBER	DESCRIPTION	CIRCUIT DIAGRAM SHEET NUMBER	CIRCUIT DIAGRAM GRID REFERENCE	COMPONENT LAYOUT
A2	C501	0160-0174	C-F .47UF 25V			
A2	C502	0160-0174	C-F .47UF 25V			
A2	C503	0160-0174	C-F .47UF 25V			
A2	C504	0160-0174	C-F .47UF 25V			
A2	C505	0160-0174	C-F .47UF 25V			
A2	C506	0160-2930	C-F .01UF 100V			
A2	C507	0160-2930	C-F .01UF 100V			
A2	C601	0160-0174	C-F .47UF 25V			
A2	C602	0160-0174	C-F .47UF 25V			
A2	C603	0160-0174	C-F .47UF 25V			
A2	C604	0160-0174	C-F .47UF 25V			
A2	C605	0160-0174	C-F .47UF 25V			
A2	C606	0160-0174	C-F .47UF 25V			
A2	C607	0160-3318	C-F CER .047UF			
A2	C608	0160-3752	C-F CER 1000PF			
A2	C609	0160-0174	C-F .47UF 25V			
A2	C610	0160-0174	C-F .47UF 25V			
A2	C611	0160-0174	C-F .47UF 25V			
A2	C612	0160-2327	C-F .001UF 100V			
A2	C613	0160-0127	C-F 1UF 25V			
A2	C614	0160-2327	C-F .001UF 100V			
A2	C615	0160-0127	C-F 1UF 25V			
A2	C617	0160-0174	C-F .47UF 25V			
A2	C618	0160-0174	C-F .47UF 25V			
A2	C619	0160-0174	C-F .47UF 25V			
A2	C620	0160-0174	C-F .47UF 25V			
A2	C621	0160-0174	C-F .47UF 25V			
A2	C622	0160-2930	C-F .01UF 100V			
A2	C623	0160-2930	C-F .01UF 100V			
A2	C624	0160-2327	C-F .001UF 100V			
A2	C625	0160-0174	C-F .47UF 25V			
A2	C626	0160-2327	C-F .001UF 100V			
A2	C627	0160-2327	C-F .001UF 100V			
A2	C628	0160-2327	C-F .001UF 100V			
A2	C701	0160-2199	C-F 30PF 300V			
A2	C702	0160-0174	C-F .47UF 25V			
A2	C703	0160-0174	C-F .47UF 25V			
A2	C704	0160-0174	C-F .47UF 25V			
A2	C705	0160-0127	C-F 1UF 25V			
A2	C706	0160-0174	C-F .47UF 25V			
A2	C707	0160-0174	C-F .47UF 25V			
A2	C709	0160-2930	C-F .01UF 100V			
A2	C710	0160-0174	C-F .47UF 25V			
A2	C712	0160-0174	C-F .47UF 25V			
A2	C713	0160-0174	C-F .47UF 25V			
A2	C714	0160-2327	C-F .001UF 100V			
A2	C715	0160-2327	C-F .001UF 100V			
A2	C716	0160-2327	C-F .001UF 100V			
A2	C717	0160-0174	C-F .47UF 25V			
A2	C718	0160-0174	C-F .47UF 25V			
A2	C719	0160-2327	C-F .001UF 100V			
A2	C720	0160-0127	C-F 1UF 25V			
A2	C722	0160-0127	C-F 1UF 25V			
A2	C724	0160-2327	C-F .001UF 100V			
A2	C725	0160-0127	C-F 1UF 25V			
A2	C726	0160-2327	C-F .001UF 100V			
A2	C727	0160-2327	C-F .001UF 100V			
A2	C728	0160-0127	C-F 1UF 25V			
A2	C729	0160-2930	C-F .01UF 100V			
A2	C730	0160-2930	C-F .01UF 100V			
A2	C731	0160-0174	C-F .47UF 25V			
A2	C801	0160-2930	C-F .01UF 100V			
A2	C802	0160-0174	C-F .47UF 25V			
A2	C803	0160-0174	C-F .47UF 25V			
A2	C804	0160-2930	C-F .01UF 100V			
A2	C805	0160-2930	C-F .01UF 100V			
A2	CR501	1901-0179	DIO SI 15V .75NS			
A2	CR502	1901-0179	DIO SI 15V .75NS			
A2	CR503	1901-0179	DIO SI 15V .75NS			
A2	CR504	1901-0179	DIO SI 15V .75NS			
A2	CR505	1901-0040	DIO SI 30V .03A			
A2	CR506	1901-0040	DIO SI 30V .03A			
A2	CR601	1901-0179	DIO SI 15V .75NS			
A2	CR602	1901-0179	DIO SI 15V .75NS			
A2	CR603	1901-0179	DIO SI 15V .75NS			
A2	CR604	1901-0179	DIO SI 15V .75NS			
A2	CR605	1901-0533	DIO HOT CARR			
A2	CR606	1901-0533	DIO HOT CARR			
A2	CR701	1901-0040	DIO SI 30V .03A			
A2	CR702	1901-0040	DIO SI 30V .03A			
A2	CR703	1901-0179	DIO SI 15V .75NS			
A2	CR704	1901-0179	DIO SI 15V .75NS			
A2	CR705	1901-0533	DIO HOT CARR			
A2	CR706	1901-0533	DIO HOT CARR			
A2	CR707	1901-0040	DIO SI 30V .03A			
A2	CR708	1902-3137	DIO BKDN 8.06 V			
A2	CR709	1901-0533	DIO HOT CARR			
A2	CR710	1902-3137	DIO BKDN 8.06 V			
A2	CR711	1901-0533	DIO HOT CARR			
A2	CR712	1901-0040	DIO SI 30V .03A			

REFERENCE DESIGNATOR		H-P PART NUMBER	DESCRIPTION	CIRCUIT DIAGRAM SHEET NUMBER	CIRCUIT DIAGRAM GRID REFERENCE	COMPONENT LAYOUT
A2	CR801	1901-0050	DIO SI 80V .2A			
A2	CR802	1901-0050	DIO SI 80V .2A			
A2	CR803	1901-0050	DIO SI 80V .2A			
A2	CR804	1901-0050	DIO SI 80V .2A			
A2	L601	9140-0137	COIL-FXD 1000 UH			
A2	L602	9140-0137	COIL-FXD 1000 UH			
A2	L603	9100-2247	COIL-CHOKE .10UH			
A2	L604	9100-2247	COIL-CHOKE .10UH			
A2	L605	9170-0016	BEAD SHLD			
A2	L606	9170-0016	BEAD SHLD			
A2	L607	9170-0016	BEAD SHLD			
A2	L608	9170-0016	BEAD SHLD			
A2	L701	9100-2250	COIL-CHOKE .18UH			
A2	L702	9170-0016	BEAD SHLD			
A2	L703	9170-0016	BEAD SHLD			
A2	L704	9100-1611	COIL CHOKE .22UH			
A2	MC601	1820-0285	IC 250MHZ 16PIN			
A2	MC701	1858-0030	XSTR ARRAY 8YC80			
A2	Q501	1853-0203	XSTR SI PNP			
A2	Q502	1853-0203	XSTR SI PNP			
A2	Q503	1854-0345	XSTR 2N5179 SI			
A2	Q504	1854-0345	XSTR 2N5179 SI			
A2	Q505	1854-0307	XSTR SI NPN			
A2	Q506	1854-0307	XSTR SI NPN			
A2	Q507	1853-0090	XSTR SI PNP			
A2	Q508	1853-0090	XSTR SI PNP			
A2	Q601	1854-0269	XSTR SI NPN			
A2	Q602	1854-0269	XSTR SI NPN			
A2	Q603	1853-0218	XSTR SI PNP			
A2	Q604	1853-0218	XSTR SI PNP			
A2	Q605	1854-0305	XSTR SI NPN			
A2	Q606	1854-0305	XSTR SI NPN			
A2	Q607	1853-0061	XSTR SI PNP			
A2	Q608	1853-0061	XSTR SI PNP			
A2	Q609	1853-0090	XSTR SI PNP			
A2	Q610	1854-0307	XSTR SI NPN			
A2	Q611	1853-0090	XSTR SI PNP			
A2	Q612	1854-0307	XSTR SI NPN			
A2	Q613	1853-0018	XSTR SI PNP			
A2	Q614	1853-0018	XSTR SI PNP			
A2	Q615	1854-0345	XSTR 2N5179 SI			
A2	Q616	1854-0345	XSTR 2N5179 SI			
A2	Q617	1854-0345	XSTR 2N5179 SI			
A2	Q618	1853-0018	XSTR SI PNP			
A2	Q701	1854-0345	XSTR 2N5179 SI			
A2	Q702	1854-0345	XSTR 2N5179 SI			
A2	Q703	1854-0307	XSTR SI NPN			
A2	Q704	1853-0090	XSTR SI PNP			
A2	Q705	1854-0345	XSTR 2N5179 SI			
A2	Q706	1853-0090	XSTR SI PNP			
A2	Q707	1854-0307	XSTR SI NPN			
A2	Q708	1853-0090	XSTR SI PNP			
A2	Q709	1853-0203	XSTR SI PNP			
A2	Q710	1854-0345	XSTR 2N5179 SI			
A2	Q711	1853-0203	XSTR SI PNP			
A2	Q712	1854-0305	XSTR SI NPN			
A2	Q713	1853-0315	XSTR PNP TO-5			
A2	Q714	1854-0498	XSTR NPN SI			
A2	Q715	1853-0315	XSTR PNP TO-5			
A2	Q716	1854-0498	XSTR NPN SI			
A2	Q717	1853-0090	XSTR SI PNP			
A2	Q718	1854-0307	XSTR SI NPN			
A2	Q719	1854-0307	XSTR SI NPN			
A2	Q720	1853-0090	XSTR SI PNP			
A2	Q801	1854-0329	XSTR SI NPN			
A2	Q802	1853-0289	XSTR SI PNP			
A2	Q803	1854-0039	XSTR 2N3053 SI			
A2	Q804	1853-0289	XSTR SI PNP			
A2	Q805	1854-0039	XSTR 2N3053 SI			
A2	Q806	1853-0289	XSTR SI PNP			
A2	Q807	1854-0329	XSTR SI NPN			
A2	Q808	1853-0027	XSTR SI PNP			
A2	Q809	1854-0329	XSTR SI NPN			
A2	Q810	1853-0027	XSTR SI PNP			
A2	R501	0698-4226	R-F 62 5% .125W			
A2	R502	0698-4243	R-F 330 5% .125W			
A2	R503	0698-4227	R-F 68 5% .125W			
A2	R504	0698-4252	R-F 820 5% .125W			
A2	R505	0698-4227	R-F 68 5% .125W			
A2	R506	0698-4227	R-F 68 5% .125W			
A2	R507	0698-4227	R-F 68 5% .125W			
A2	R508	0698-3800	R-F 24 5% .125W			
A2	R509	0698-3800	R-F 24 5% .125W			
A2	R510	0698-4251	R-F 750 5% .125W			
A2	R511	0698-4271	R-F 5.1K5% .125W			
A2	R512	0698-4271	R-F 5.1K5% .125W			
A2	R513	0698-4274	R-F 6.8K5% .125W			
A2	R514	0698-4264	R-F 2.7K5% .125W			

DIAGRAM 3 (1)
SHT 3 OF 6

REFERENCE DESIGNATOR		H-P PART NUMBER	DESCRIPTION	CIRCUIT DIAGRAM SHEET NUMBER	CIRCUIT DIAGRAM GRID REFERENCE	COMPONENT LAYOUT
A2	R515	0698-4274	R-F 6.8K5% .125W			
A2	R516	0698-4266	R-F 3.3K5% .125W			
A2	R517	0698-4271	R-F 5.1K5% .125W			
A2	R518	0698-4271	R-F 5.1K5% .125W			
A2	R519	0698-4271	R-F 5.1K5% .125W			
A2	R520	0698-4271	R-F 5.1K5% .125W			
A2	R601	0698-4261	R-F 2K5% .125W F			
A2	R602	0698-4241	R-F 270 5% .125W			
A2	R603	0698-4241	R-F 270 5% .125W			
A2	R604	0698-6746	R-F 43 5% .125W			
A2	R605	0698-6746	R-F 43 5% .125W			
A2	R607	0758-0028	R-F 270 5% .25W			
A2	R608	0698-6746	R-F 43 5% .125W			
A2	R609	0698-6802	R-F 10 5% .125W			
A2	R610	0698-6802	R-F 10 5% .125W			
A2	R611	0698-6746	R-F 43 5% .125W			
A2	R612	0698-6746	R-F 43 5% .125W			
A2	R613	0698-6802	R-F 10 5% .125W			
A2	R614	0698-6802	R-F 10 5% .125W			
A2	R615	0698-6746	R-F 43 5% .125W			
A2	R618	0698-6746	R-F 43 5% .125W			
A2	R619	0698-4226	R-F 62 5% .125W			
A2	R620	0698-4238	R-F 200 5% .125W			
A2	R621	0698-4242	R-F 300 5% .125W			
A2	R622	0698-4238	R-F 200 5% .125W			
A2	R623	0698-6746	R-F 43 5% .125W			
A2	R624	0698-4226	R-F 62 5% .125W			
A2	R625	0698-4270	R-F 4.7K5% .125W			
A2	R628	0698-4270	R-F 4.7K5% .125W			
A2	R629	0698-4230	R-F 82 5% .125W			
A2	R630	0698-4230	R-F 82 5% .125W			
A2	R631	0698-4254	R-F 1K5% .125W F			
A2	R632	2100-2799	R-VAR 2.2K .5W			
A2	R633	0698-4266	R-F 3.3K5% .125W			
A2	R634	0698-4250	R-F 680 5% .125W			
A2	R635	0758-0086	R-F 100 5% .125W			
A2	R636	0758-0086	R-F 100 5% .125W			
A2	R637	0698-4250	R-F 680 5% .125W			
A2	R638	0698-4254	R-F 1K5% .125W F			
A2	R639	2100-2799	R-VAR 2.2K .5W			
A2	R640	0698-4266	R-F 3.3K5% .125W			
A2	R641	0698-4254	R-F 1K5% .125W F			
A2	R642	0698-6746	R-F 43 5% .125W			
A2	R643	0698-5702	R-F 30 5% .125W			
A2	R644	0698-5702	R-F 30 5% .125W			
A2	R645	0698-6746	R-F 43 5% .125W			
A2	R646	0698-4254	R-F 1K5% .125W F			
A2	R647	0698-6746	R-F 43 5% .125W			
A2	R648	0698-4227	R-F 68 5% .125W			
A2	R649	0698-4227	R-F 68 5% .125W			
A2	R650	0698-6746	R-F 43 5% .125W			
A2	R651	0698-3800	R-F 24 5% .125W			
A2	R652	0698-3800	R-F 24 5% .125W			
A2	R653	0757-0405	R-F 162 1% .125W			
A2	R701	0698-6744	R-F 20 5% .125W			
A2	R702	0758-0086	R-F 100 5% .125W			
A2	R703	0698-4270	R-F 4.7K5% .125W			
A2	R704	0698-6746	R-F 43 5% .125W			
A2	R705	0698-6746	R-F 43 5% .125W			
A2	R706	0757-0290	R-F 6.19K1%			
A2	R707	0757-0279	R-F 3.16K1%			
A2	R708	0757-0714	R-F 130 1% .25W			
A2	R709	0698-3443	R-F 287 1% .125W			
A2	R710	0698-6746	R-F 43 5% .125W			
A2	R711	0698-5172	R-F 13 5% .125W			
A2	R712	0698-6746	R-F 43 5% .125W			
A2	R713	0698-5172	R-F 13 5% .125W			
A2	R714	0758-0023	R-F 240 5% .25W			
A2	R715	0758-0023	R-F 240 5% .25W			
A2	R716	0698-6746	R-F 43 5% .125W			
A2	R717	0758-0083	R-F 68 5% .25W F			
A2	R718	0698-6746	R-F 43 5% .125W			
A2	R719	0698-6746	R-F 43 5% .125W			
A2	R719	0757-0714	R-F 130 1% .25W			
A2	R720	0698-4246	R-F 470 5% .125W			
A2	R721	0698-6746	R-F 43 5% .125W			
A2	R722	0698-4261	R-F 2K5% .125W F			
A2	R723	0698-6746	R-F 43 5% .125W			
A2	R724	2100-2742	R-VAR 10K20% .5W			
A2	R725	0698-4269	R-F 4.3K5% .125W			
A2	R727	0698-3151	R-F 2.87K1%			
A2	R728	0698-4247	R-F 510 5% .125W			
A2	R729	0698-4250	R-F 680 5% .125W			
A2	R730	0698-0083	R-F 1.96K1%			
A2	R731	0757-0289	R-F 13.3K1%			
A2	R732	2100-2740	R-VAR 22K .5W CE			
A2	R733	0757-0289	R-F 13.3K1%			
A2	R734	0698-0083	R-F 1.96K1%			
A2	R735	0698-4278	R-F 10K5% .125W			
A2	R736	0698-4278	R-F 10K5% .125W			
A2	R737	0698-5702	R-F 30 5% .125W			

REFERENCE DESIGNATOR		H-P PART NUMBER	DESCRIPTION	CIRCUIT DIAGRAM SHEET NUMBER	CIRCUIT DIAGRAM GRID REFERENCE	COMPONENT LAYOUT
A2	R738	0698-5702	R-F 30 5% .125W			
A2	R739	0757-0395	R-F 56.2 1%			
A2	R740	0757-0395	R-F 56.2 1%			
A2	R741	0698-6802	R-F 10 5% .125W			
A2	R742	0698-6802	R-F 10 5% .125W			
A2	R743	0698-5884	R-F 22 5% .25W F			
A2	R744	0698-5884	R-F 22 5% .25W F			
A2	R745	0698-5886	R-F 27 5% .25W F			
A2	R746	0698-5886	R-F 27 5% .25W F			
A2	R747	0698-6802	R-F 10 5% .125W			
A2	R748	0698-6802	R-F 10 5% .125W			
A2	R750	0757-0806	R-F 243 1% .5W			
A2	R751	0757-0806	R-F 243 1% .5W			
A2	R752	0757-0806	R-F 243 1% .5W			
A2	R753	0698-3155	R-F 4.64K1%			
A2	R754	0757-0812	R-F 432 1% .5W			
A2	R755	0757-0812	R-F 432 1% .5W			
A2	R756	0757-0810	R-F 365 1% .5W			
A2	R758	0698-4250	R-F 680 5% .125W			
A2	R759	0698-4276	R-F 8.2K5% .125W			
A2	R760	2100-2799	R-VAR 2.2K .5W			
A2	R761	0698-4261	R-F 2K5% .125W F			
A2	R762	0698-4257	R-F 1.3K5% .125W			
A2	R763	0698-4257	R-F 1.3K5% .125W			
A2	R764	0698-4276	R-F 8.2K5% .125W			
A2	R765	2100-2799	R-VAR 2.2K .5W			
A2	R766	0698-4261	R-F 2K5% .125W F			
A2	R767	0698-4250	R-F 680 5% .125W			
A2	R801	0698-3450	R-F 42.2K1%			
A2	R802	0698-3159	R-F 26.1K1%			
A2	R803	0698-0082	R-F 464 1% .125W			
A2	R804	0698-0082	R-F 464 1% .125W			
A2	R805	0698-3159	R-F 26.1K1%			
A2	R806	0757-0417	R-F 562 1% .125W			
A2	R807	0757-0280	R-F 1K1% .125W F			
A2	R808	0757-0280	R-F 1K1% .125W F			
A2	R809	0757-0417	R-F 562 1% .125W			
A2	R810	0698-3430	R-F 21.5 1%			
A2	R811	0698-4244	R-F 360 5% .125W			
A2	R812	0698-3430	R-F 21.5 1%			
A2	R813	0698-4244	R-F 360 5% .125W			
A2	R814	0698-3430	R-F 21.5 1%			
A2	R815	0698-4244	R-F 360 5% .125W			
A2	R816	0698-3430	R-F 21.5 1%			
A2	R817	0698-4244	R-F 360 5% .125W			
A2	R818	0698-4261	R-F 2K5% .125W F			

DIAGRAM 3 (1)
5041406

*Test Set-Up for Waveforms Shown

HP 140A with 1410A and 1425A Plug-ins

Sweep: 50ns/cm
Sensitivity: 100mV/cm
Probe with 10:1 divider

8007B Settings

Pulse Period: < 170ns
Delay: minimum
Width: ~ 100ns
Mode: NORM
SYMM.NORM.COMPL.:NORM
Pulse Polarity: +

** Test Set-Up same as for waveform 13 except scope sensitivity is 200mV/cm.

The scope centerline is +0.8V for waveform 14 and at −0.8V for waveform 15.

DIAGRAM 3(1)
SHT 5 of 6

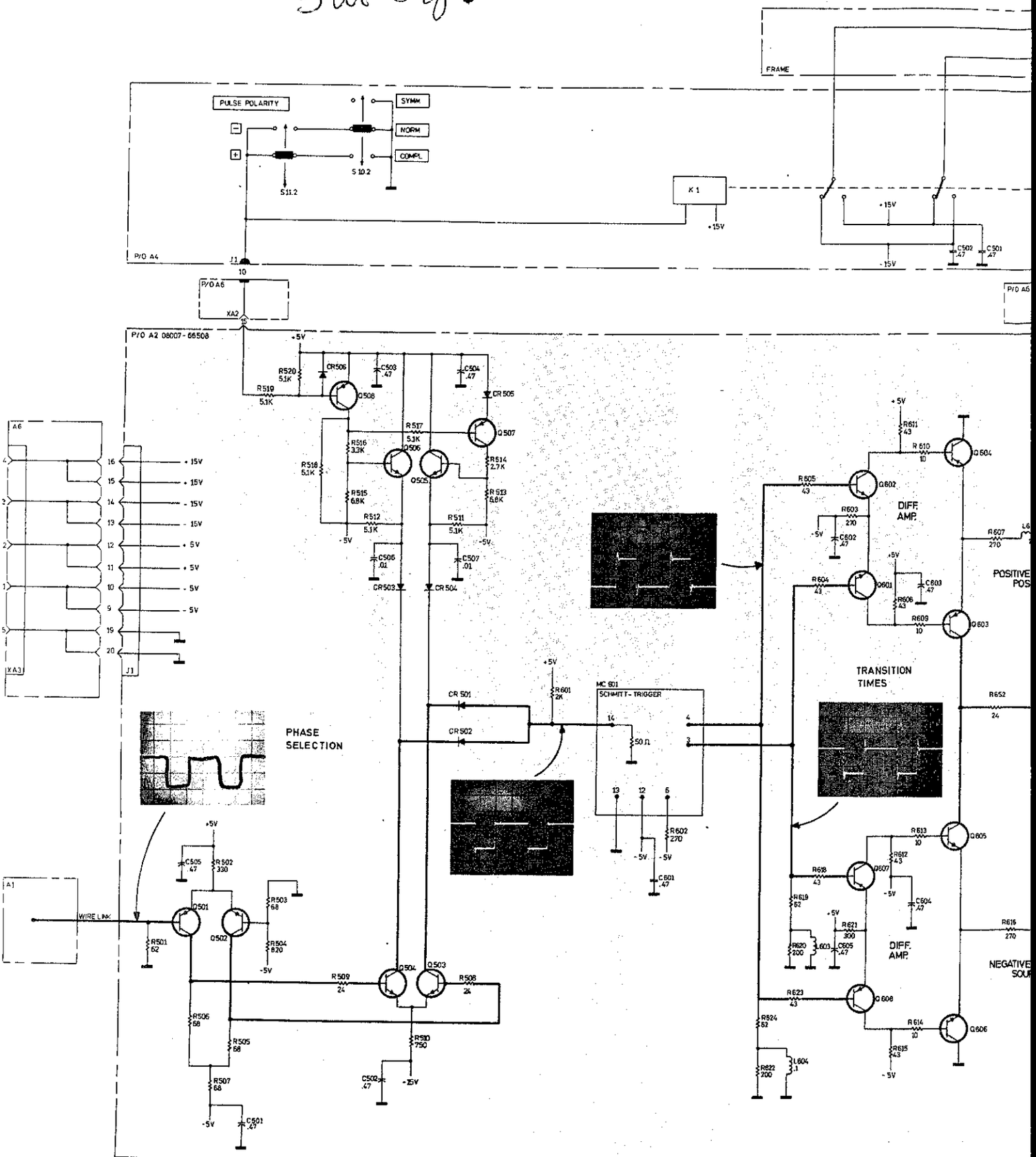


DIAGRAM 3 (1)
SHT 6 of 6

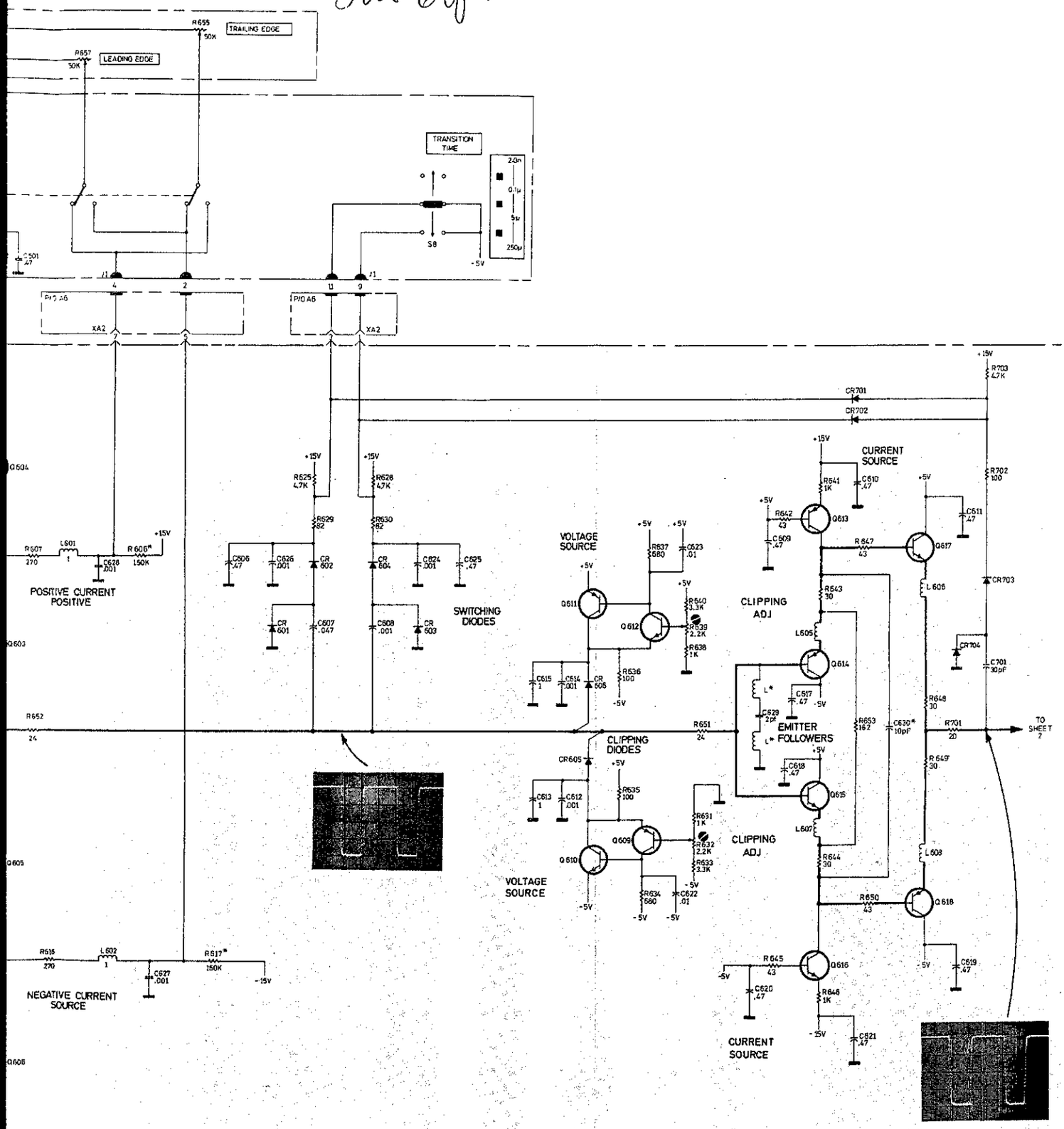


DIAGRAM 3 (2)
SHT 1 of 3

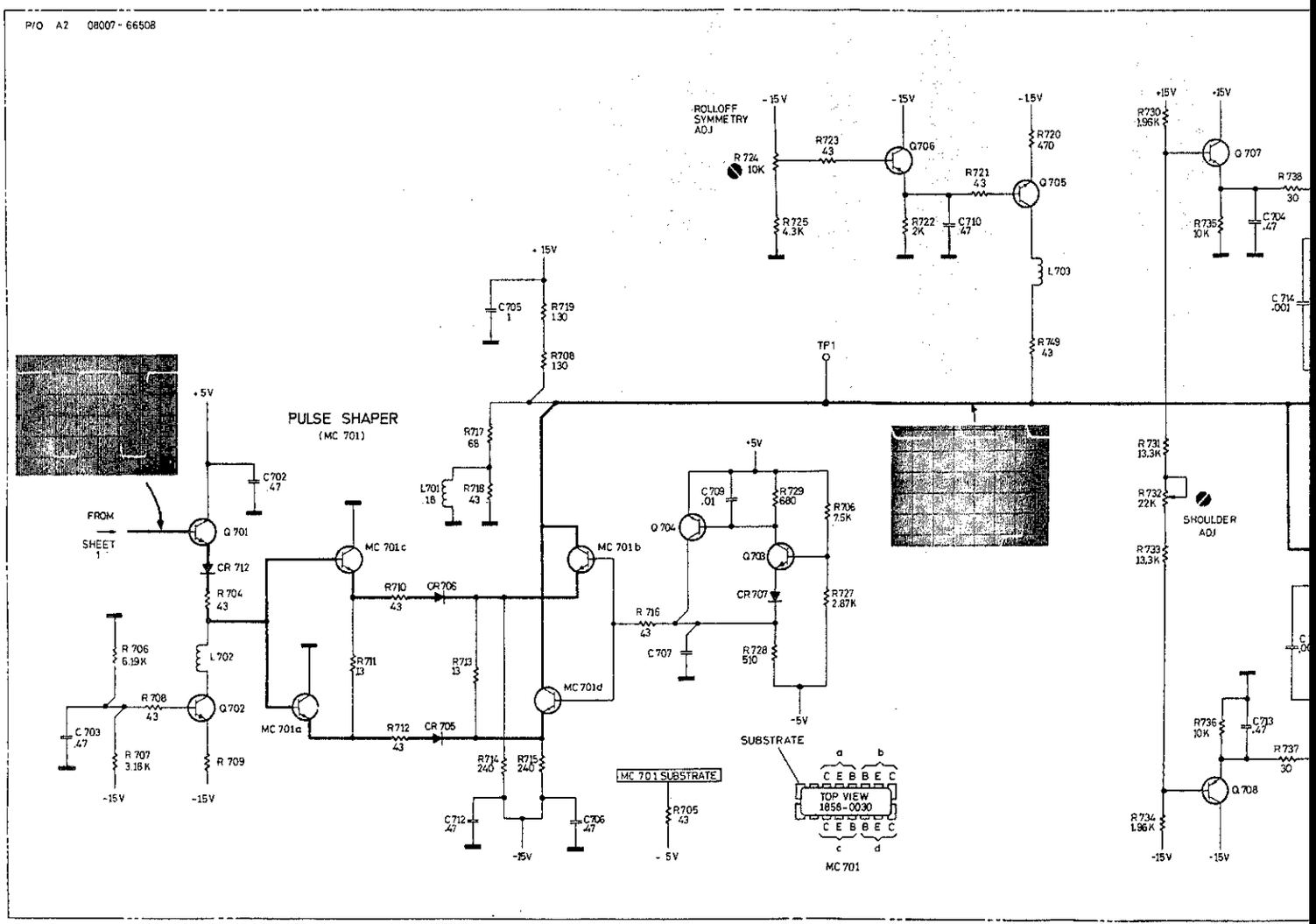
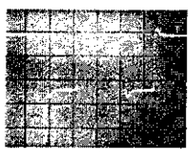
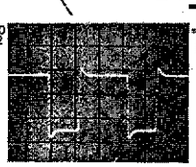


DIAGRAM 3(2)
SHT 2 OF 3





P/O A4

PULSE POLARITY

SYMM NORM COMPL

-15V

S11.1

S10.1

SYMM

NORM

COMPL.

-15V

J3

12

P/O A6

17

J1

+15V

-15V

R720 470

Q705

L703

R749 43

R730 1.96K

Q707

R739 56.2

R738 30

Q709

R735 10K

C704 .47

R742 10

CR708

Q711

C714 .001

C716 .001

R731 13.3K

R732 22K

SHOULDER ADJ

R733 13.3K

-5V

+5V

Q712

C718 .47

C717 .47

CR710

C715 .001

R741 10

R736 10K

C713 .47

R737 30

Q710

Q708

R740 36.2

R734 1.96K

Q713

R743 22

CR709

C719 .001

R745 27

C720 1

Q715

R748 10

C727 .001

R768* (0-10)

C728 1

Q717

C729 .01

R767 680

Q718

R766 2K

R765 2.2K

NEG BASELINE ADJ

R764 8.2K

R763 1.3K

C731 .47

L704 .22

R757* 36

SYMM. NORM. COMPL. AND

R753 4.64K

R754 432

R755 432

R756 365

PULSE POLARITY SWITCHING (Q707 - Q720)

R750 243

R751 243

R752 243

Q714

Q716

R744 22

CR711

R746 27

C724 .001

C722 1

R769* (0-10)

C726 .001

R747 10

C725 .47

R762 1.3K

Q720

Q719

R759 8.2K

R760 2.2K

POS BASELINE ADJ

R761 2K

C730 .01

R758 680

DIAGRAM 3 (2)
SHT 3 of 3

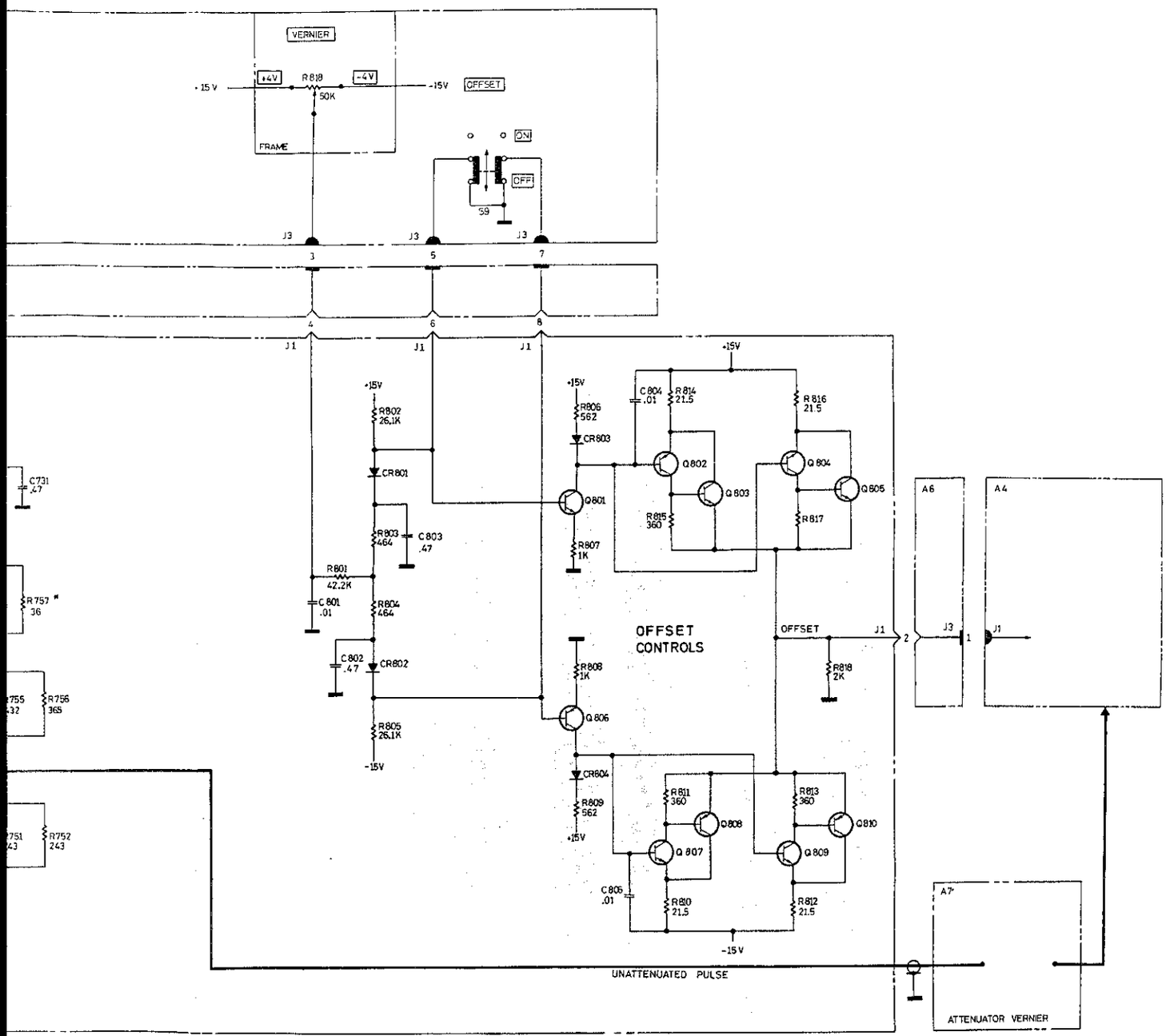
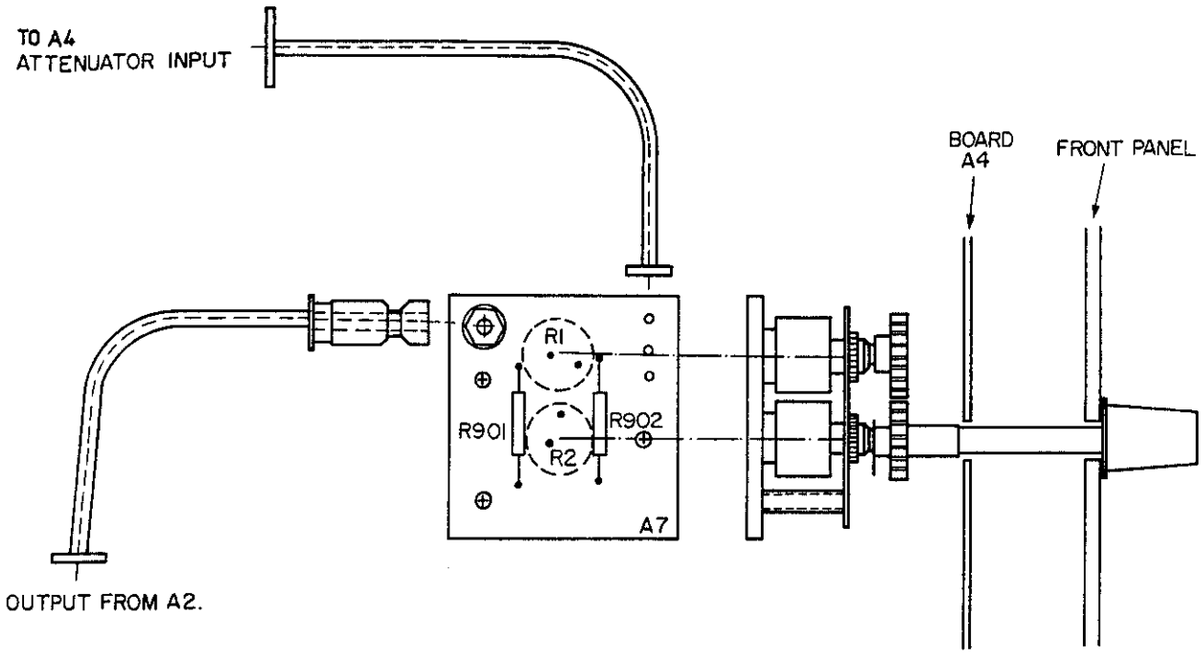


DIAGRAM 4
SHT 1 OF 4



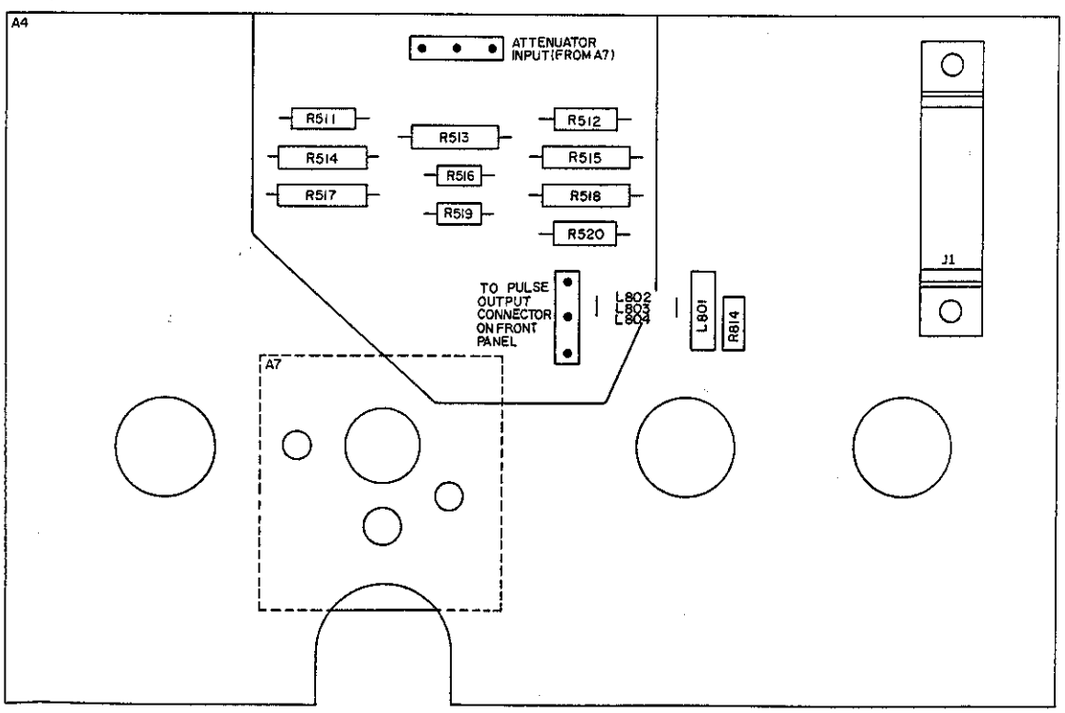


DIAGRAM 4
SHT 2 of 4

REFERENCE DESIGNATOR		H-P PART NUMBER	DESCRIPTION	CIRCUIT DIAGRAM		COMPONENT LAYOUT
				SHEET NUMBER	GRID REFERENCE	
A7		08007-66507	BD VERNATT			
A7	A7	08007-66507	BD VERNATT			
A7	MP1	1490-0841	COUPLER SHAFT			
A7	MP2	01802-22401	GEARSPUR			
A7	R1	2100-3080	R-VAR 1K .25W CC			
A7	R2	2100-3080	R-VAR 1K .25W CC			
A7	R901	0698-5965	R-F 50 1% .5W MF			
A7	R902	0698-5965	R-F 50 1% .5W MF			

REFERENCE DESIGNATOR		H-P PART NUMBER	DESCRIPTION	CIRCUIT DIAGRAM		COMPONENT LAYOUT
				SHEET NUMBER	GRID REFERENCE	
A4	C501	0160-0174	C-F .47UF 25V			
A4	C502	0160-0174	C-F .47UF 25V			
A4	J1	5060-0112	SPCRCONN15 PIN			
A4	K1	0490-1090	RELAY 4 FORM C			
A4	L801	9140-0118	COIL-CHOKE 500UH			
A4	L802	9170-0029	CORE FERRI BEAD			
A4	L803	9170-0029	CORE FERRI BEAD			
A4	L804	9170-0029	CORE FERRI BEAD			
A4	MP1	5020-3440	SPG DTT			
A4	R511	0757-0801	R-F 150 1% .5W			
A4	R512	0757-0801	R-F 150 1% .5W			
A4	R513	0757-0172	R-F 37.4 1% .5W			
A4	R514	0757-0795	R-F 75 1% .5W MF			
A4	R516	0757-0069	R-F 121 1% .25W			
A4	R517	0757-1002	R-F 61.9 1% .5W			
A4	R518	0757-1002	R-F 61.9 1% .5W			
A4	R519	0757-0071	R-F 247.5 1%			
A4	R519	0757-0795	R-F 75 1% .5W MF			
A4	R520	0698-5965	R-F 50 1% .5W MF			
A4	R814	0698-4264	R-F 2.7K5% .125W			
A4	R815	0698-4261	R-F 2K5% .125W F			
A4	S8	5040-1107	SLIDAY PC SW			
A4	S9	5040-1106	SLIDAY PC SW			
A4	S10	5040-1106	SLIDAY PC SW			
A4	S11	5040-1106	SLIDAY PC SW			
A4	S12	5040-1108	SLIDAY PC SW			

*Test Set-Up for Waveforms Shown

HP 140A with 1410A and 1425A Plug-ins

Sweep: 50ns/cm
Sensitivity: 100mV/cm
Probe with 10:1 divider

8007B Settings

Pulse Period: < 170ns
Delay: minimum
Width: ~ 100ns
Mode: NORM
SYMM.NORM.COMPL.:NORM
Pulse Polarity: +

DIAGRAM 4
SHT 3 of 4

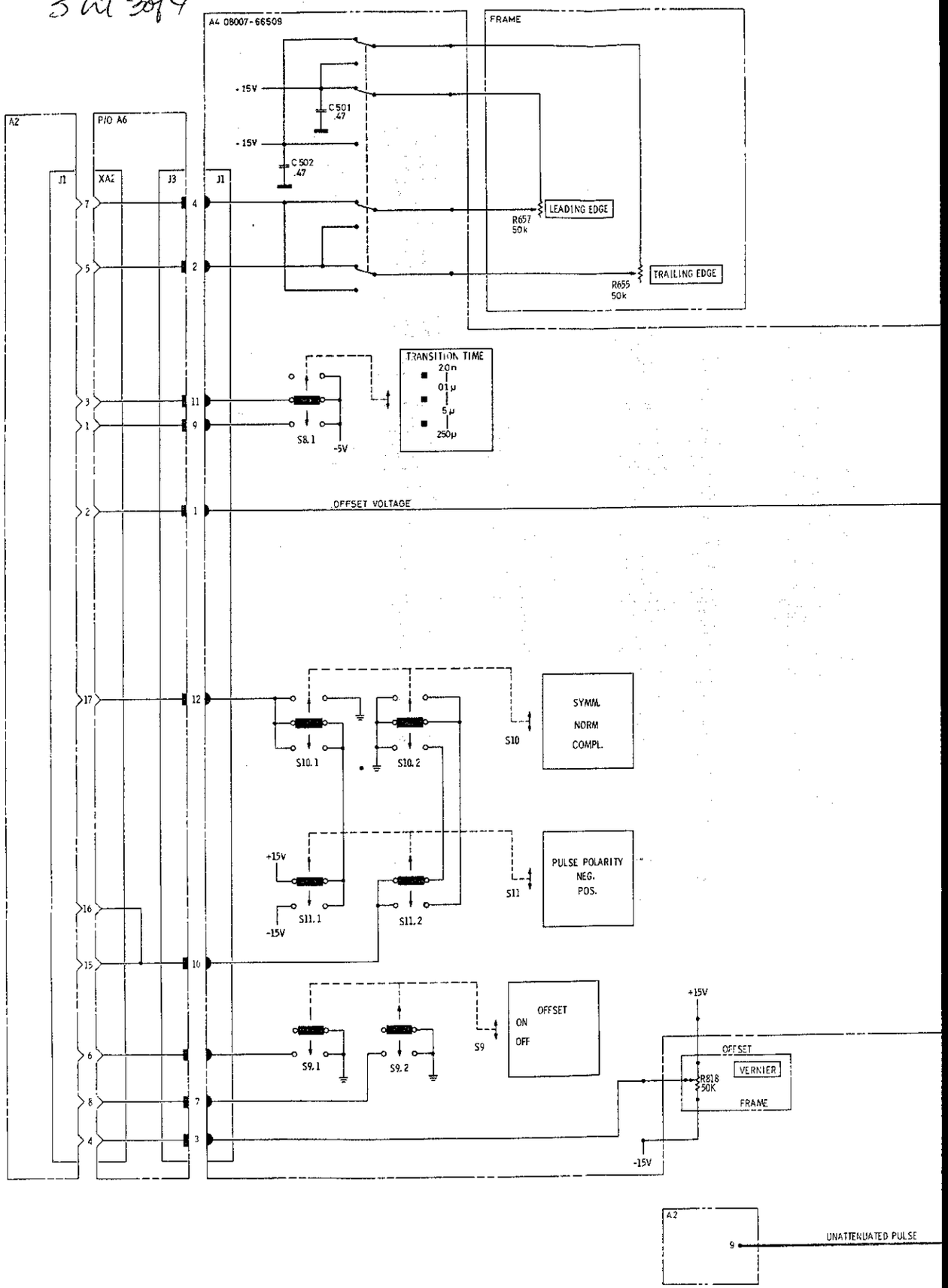


DIAGRAM 4
Sht 4 of 4

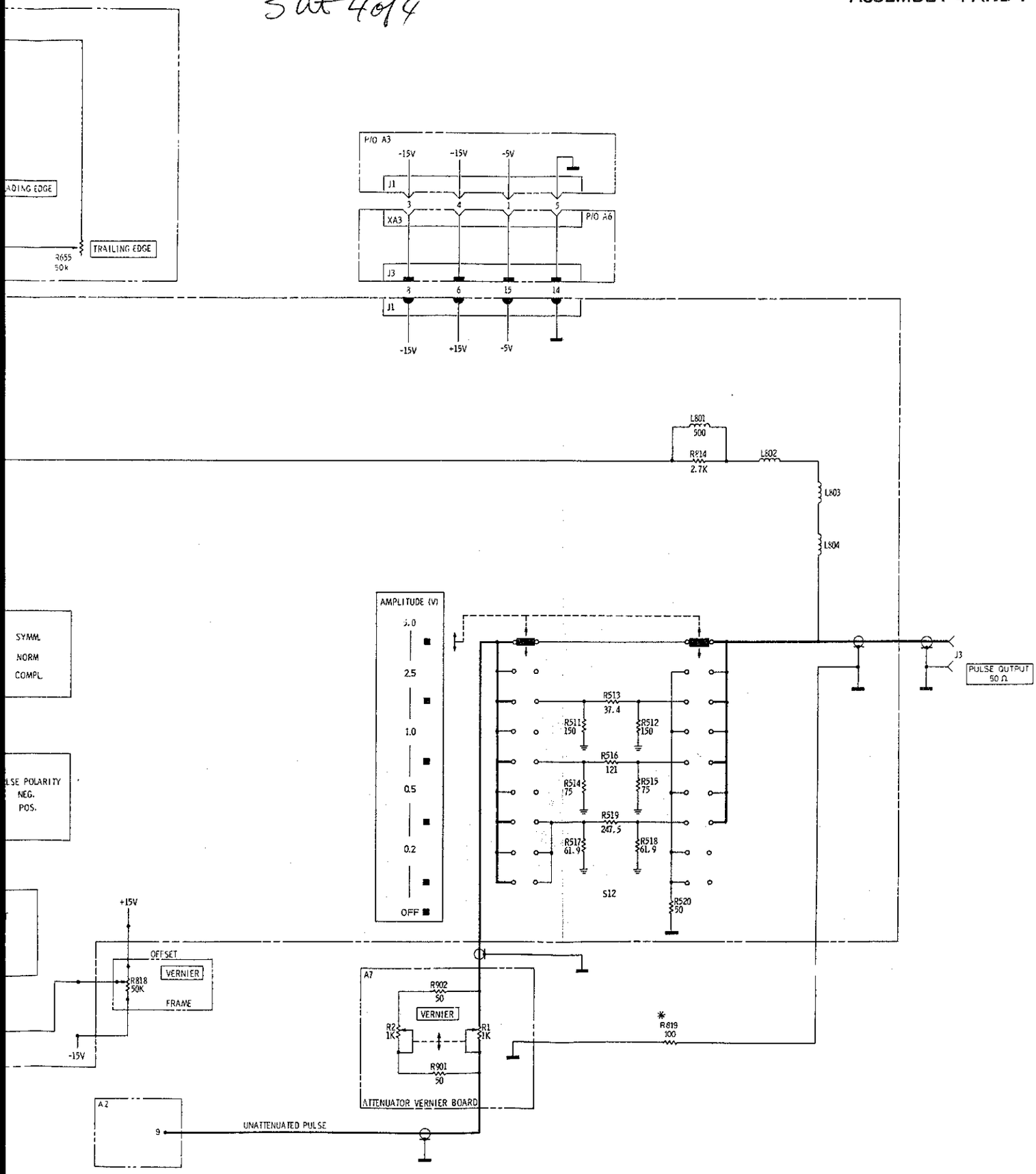
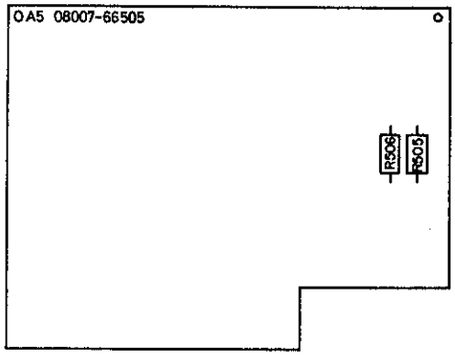


DIAGRAM 5
SHT 1 OF 4



REFERENCE DESIGNATOR	H-P PART NUMBER	DESCRIPTION	CIRCUIT DIAGRAM		COMPONENT LAYOUT
			SHEET NUMBER	GRID REFERENCE	
A5 J1	5060-0111	CONN30 CONT			
A5 J2	5060-0112	SPC*CONN15 PIN			
A5 MP1	5020-3440	SPG DTT			
A5 R505	0698-4251	R-F 750 5% .125W			
A5 R506	0698-4251	R-F 750 5% .125W			
A5 S1	5040-1107	SLIDAY PC SW			
A5 S2	5040-1107	SLIDAY PC SW			
A5 S3	5040-1107	SLIDAY PC SW			
A5 S4	5040-1107	SLIDAY PC SW			
A5 S5	5040-1107	SLIDAY PC SW			
A5 S6	5040-1105	SLIDAY PC SW			

DIAGRAMS
SET 2 of 4

*Test Set-Up for Waveforms Shown

HP 140A with 1410A and 1425A Plug-ins

Sweep: 50ns/cm
Sensitivity: 100mV/cm
Probe with 10:1 divider

8007B Settings

Pulse Period: < 170ns
Delay: minimum
Width: ~ 100ns
Mode: NORM
SYMM.NORM.COMPL.:NORM
Pulse Polarity: +

DIAGRAMS
SHT 3 of 4

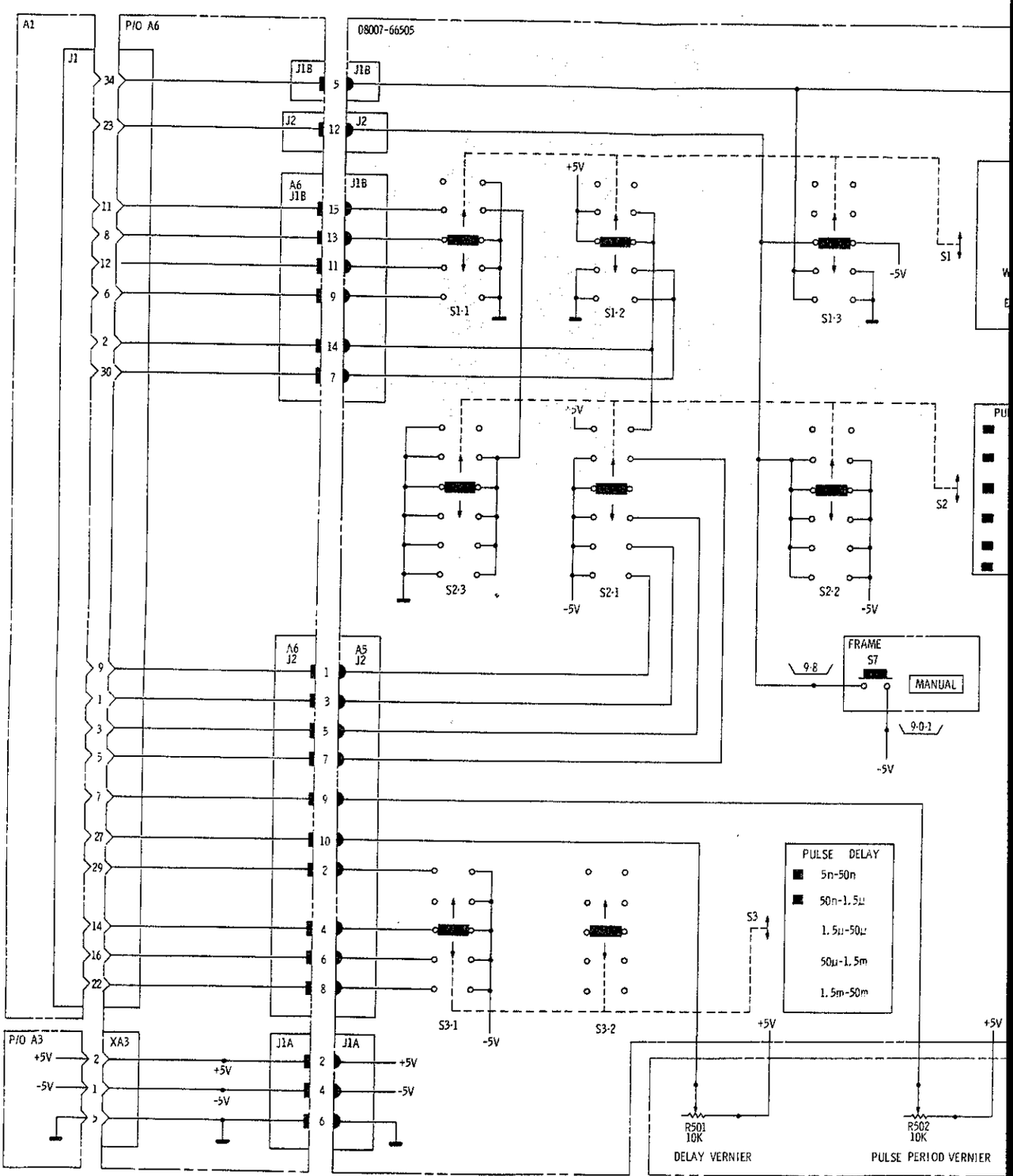


DIAGRAM 5
SHT 4 of 4

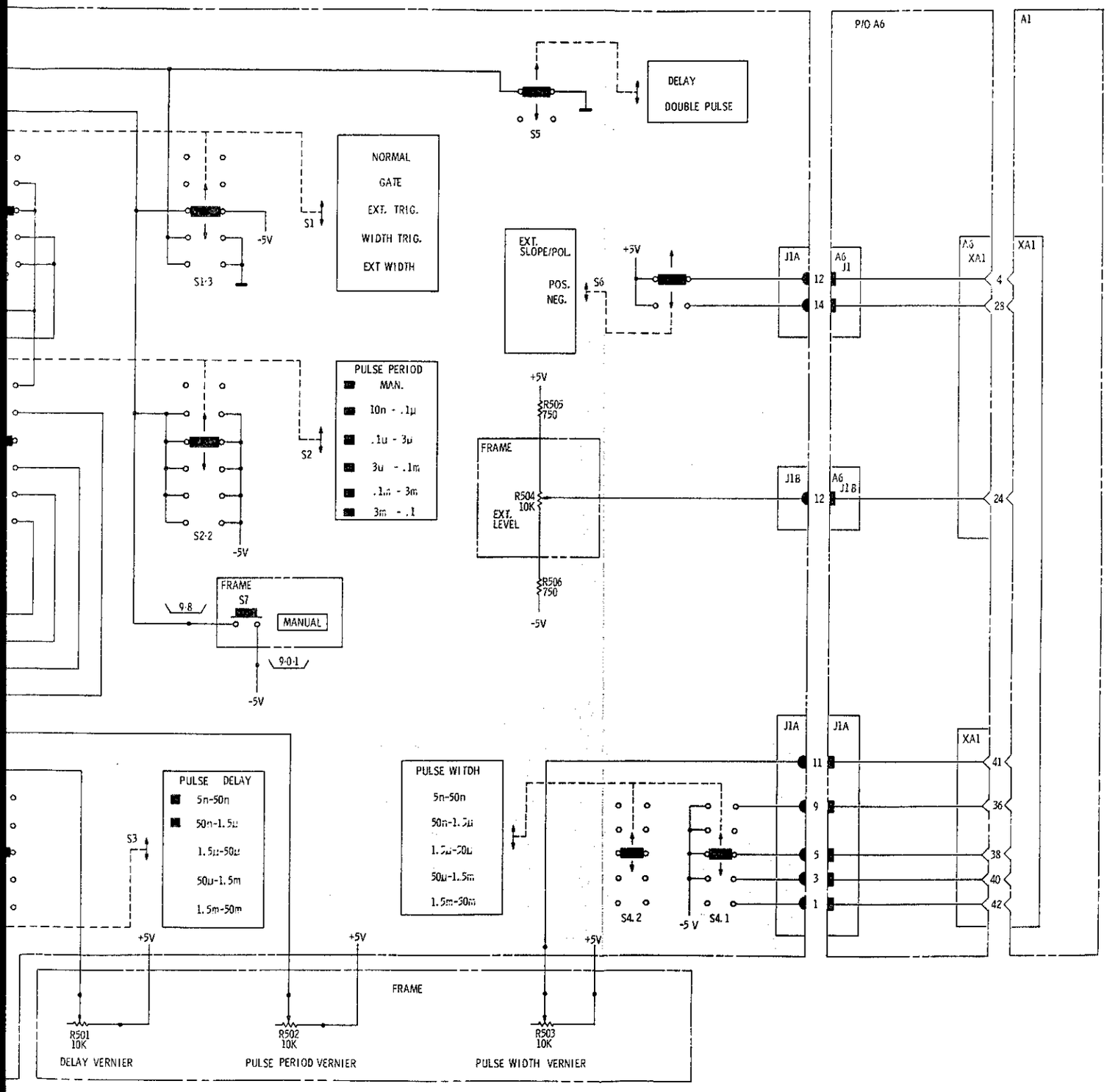
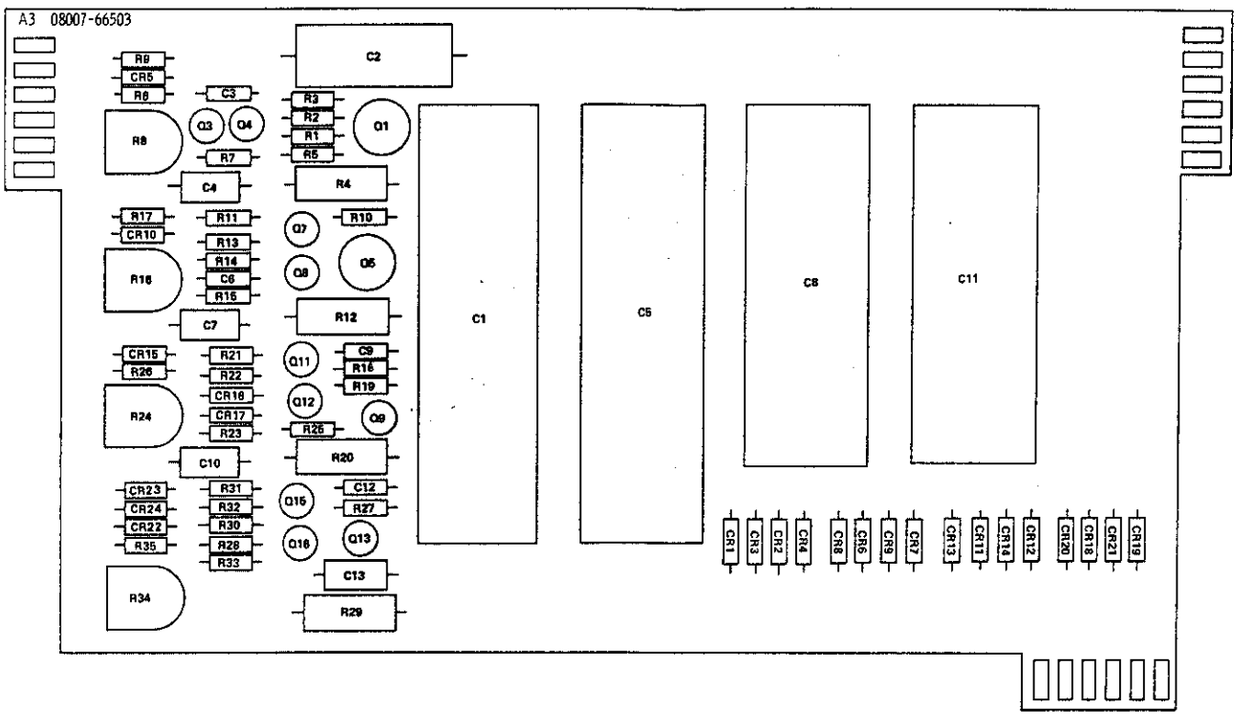
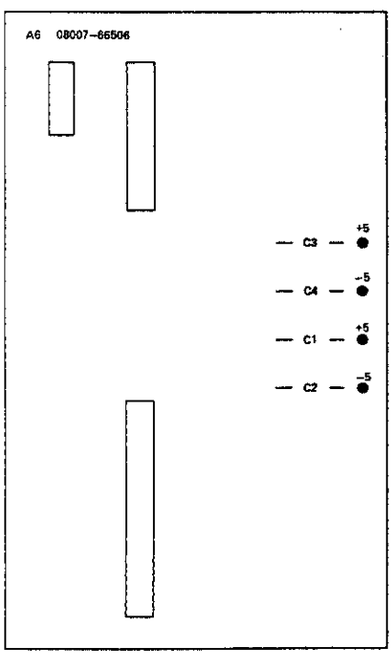


DIAGRAM 6
Sht 1 of 4





REFERENCE DESIGNATOR		H-P PART NUMBER	DESCRIPTION	CIRCUIT DIAGRAM SHEET NUMBER	CIRCUIT DIAGRAM GRID REFERENCE	COMPONENT LAYOUT
A6	C1	0180-1747	C-F 15CUF 15V			
A6	C2	0180-1747	C-F 15OUF 15V			
A6	C3	0180-0137	C-F 10CUF 10V			
A6	C4	0180-0137	C-F 10CUF 10V			

DIAGRAM 6
Sht 2 of 4

REFERENCE DESIGNATOR		H-P PART NUMBER	DESCRIPTION	CIRCUIT DIAGRAM		COMPONENT LAYOUT
				SHEET NUMBER	GRID REFERENCE	
A3	C1	0180-1784	C-F 1000UF 40V			
A3	C2	0180-0050	C-F 40UF 50V			
A3	C3	0160-2144	C-F .0033UF 1KV			
A3	C4	0180-0228	C-F 22UF 15V			
A3	C5	0180-1784	C-F 1000UF 40V			
A3	C6	0160-2144	C-F .0033UF 1KV			
A3	C7	0180-0228	C-F 22UF 15V			
A3	C8	0180-2154	C-F 1900UF 15V			
A3	C9	0160-2144	C-F .0033UF 1KV			
A3	C10	0180-0228	C-F 22UF 15V			
A3	C11	0180-2154	C-F 1900UF 15V			
A3	C12	0160-2144	C-F .0033UF 1KV			
A3	C13	0180-0228	C-F 22UF 15V			
A3	CR1	1901-0191	DIO SI 100V .75A			
A3	CR2	1901-0191	DIO SI 100V .75A			
A3	CR3	1901-0191	DIO SI 100V .75A			
A3	CR4	1901-0191	DIO SI 100V .75A			
A3	CR5	1902-0049	DIO BKDN 6.19 V			
A3	CR6	1901-0191	DIO SI 100V .75A			
A3	CR7	1901-0191	DIO SI 100V .75A			
A3	CR8	1901-0191	DIO SI 100V .75A			
A3	CR9	1901-0191	DIO SI 100V .75A			
A3	CR10	1902-0049	DIO BKDN 6.19 V			
A3	CR11	1901-0191	DIO SI 100V .75A			
A3	CR12	1901-0191	DIO SI 100V .75A			
A3	CR13	1901-0191	DIO SI 100V .75A			
A3	CR14	1901-0191	DIO SI 100V .75A			
A3	CR15	1902-0126	DIO BKDN 2.61 V			
A3	CR16	1901-0050	DIO SI 80V .2A			
A3	CR17	1901-0050	DIO SI 80V .2A			
A3	CR18	1901-0191	DIO SI 100V .75A			
A3	CR19	1901-0191	DIO SI 100V .75A			
A3	CR20	1901-0191	DIO SI 100V .75A			
A3	CR21	1901-0191	DIO SI 100V .75A			
A3	CR22	1902-0126	DIO BKDN 2.61 V			
A3	CR23	1901-0050	DIO SI 80V .2A			
A3	CR24	1901-0050	DIO SI 80V .2A			
A3	Q1	1854-0013	XSTR 2N2218A SI			
A3	Q3	1854-0307	XSTR SI NPN			
A3	Q4	1854-0307	XSTR SI NPN			
A3	Q5	1854-0013	XSTR 2N2218A SI			
A3	Q7	1854-0307	XSTR SI NPN			
A3	Q8	1854-0307	XSTR SI NPN			
A3	Q9	1854-0307	XSTR SI NPN			
A3	Q11	1854-0307	XSTR SI NPN			
A3	Q12	1854-0307	XSTR SI NPN			
A3	Q13	1854-0307	XSTR SI NPN			
A3	Q15	1854-0307	XSTR SI NPN			
A3	R6	0698-4261	R-F 2K5% .125W F			
A3	R7	0698-4259	R-F 1.6K5% .125W			
A3	R8	2100-2795	R-VAR 470 .5W			
A3	R9	0698-4257	R-F 1.3K5% .125W			
A3	R10	0698-4273	R-F 6.2K5% .125W			
A3	R11	0698-4276	R-F 8.2K5% .125W			
A3	R12	0811-0929	R-F .51 5% 2W PW			
A3	R13	0698-4261	R-F 2K5% .125W F			
A3	R14	0698-4261	R-F 2K5% .125W F			
A3	R15	0698-4259	R-F 1.6K5% .125W			
A3	R16	2100-2795	R-VAR 470 .5W			
A3	R17	0698-4257	R-F 1.3K5% .125W			
A3	R18	0698-4273	R-F 6.2K5% .125W			
A3	R19	0698-4263	R-F 2.4K5% .125W			
A3	R20	0811-0929	R-F .51 5% 2W PW			
A3	R21	0698-4243	R-F 330 5% .125W			
A3	R22	0698-4261	R-F 2K5% .125W F			
A3	R23	0698-4235	R-F 150 5% .125W			
A3	R24	2100-2796	R-VAR 100 .5W			
A3	R25	0698-4258	R-F 1.5K5% .125W			
A3	R26	0758-0086	R-F 100 5% .125W			
A3	R27	0698-4273	R-F 6.2K5% .125W			
A3	R28	0698-4263	R-F 2.4K5% .125W			
A3	R29	0811-0929	R-F .51 5% 2W PW			
A3	R30	0698-4243	R-F 330 5% .125W			
A3	R31	0698-4261	R-F 2K5% .125W F			
A3	R32	0698-4258	R-F 1.5K5% .125W			
A3	R33	0698-4235	R-F 150 5% .125W			
A3	R34	2100-2796	R-VAR 100 .5W			
A3	R35	0758-0086	R-F 100 5% .125W			
A3	Q16	1854-0307	XSTR SI NPN			
A3	R1	0698-4265	R-F 3K5% .125W F			
A3	R2	0698-4271	R-F 5.1K5% .125W			
A3	R3	0698-4276	R-F 8.2K5% .125W			
A3	R4	0811-0929	R-F .51 5% 2W PW			
A3	R5	0698-4261	R-F 2K5% .125W F			

DIAGRAM 6
SWT 3084

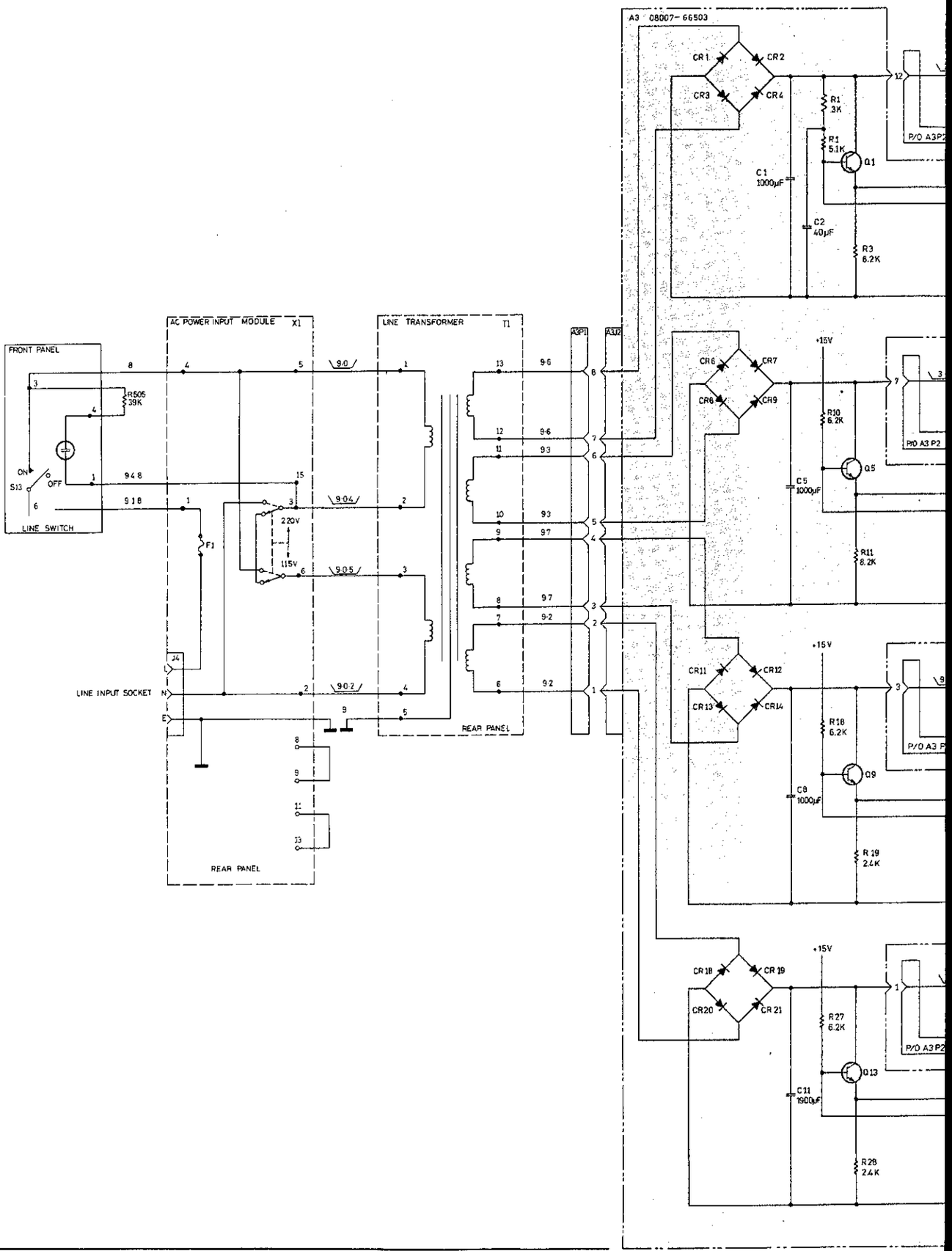


DIAGRAM 6
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